



PROFESSIONAL TRAINING REPORT

PROFESSIONAL TRAINING REPORT

Submitted in partial fulfillment of the requirements for the award of
Master of Architecture degree in Sustainable Architecture

By

SHIFANA FATHIMA .V (40890016)



**SCHOOL OF BUILDING AND ENVIRONMENT
DEPARTMENT OF ARCHITECTURE**

SATHYABAMA
INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)
Accredited with Grade "A" by NAAC
JEPPIAAR NAGAR, RAJIV GANDHI SALAI, CHENNAI - 600 119

JAN 2022



SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)

(Est U/s(3) of UGC Act,1956) Accredited with Grade "A" by NAAC (A Christian Minority Institution)

JEPPIAAR NAGAR, RAJIV GANDHI SALAI, CHEMMENCHERY, CHENNAI – 600119. TAMILNADU.

PHONE: 2450 1443/9941912481 INTERNET: www.sathyabama.ac.in

E-mail: archhod@sathyabama.ac.in



**SCHOOL OF BUILDING AND ENVIRONMENT
DEPARTMENT OF ARCHITECTURE
M. Arch (Sustainable Architecture)**

**PROFESSIONAL TRAINING PORTFOLIO (S89A PT)
JAN 2022**

Name of the Student : Shifana fathima .V

Semester : III

Reg No. : 40890016

Batch : 2020-2022



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SCHOOL OF BUILDING AND ENVIRONMENT

DEPARTMENT OF ARCHITECTURE

M. Arch (Sustainable Architecture)



BONAFIDE CERTIFICATE

This is to certify that the professional training (S89A PT) is the work of **SHIFANA FATHIMA .V (40890016)** who had undergone training in **EARTHONOMIC ENGINEERS PRIVATE LIMITED** and has been monitored by the continuous assessment during **Dec 2021 to Jan 2022.**

DR.DEVYANI GANGOPADHYAY
DEAN,

School of Building and
Environment
Department of Architecture

Submitted for Viva voce Examination held on _____

Internal Examiner

External Examiner



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DECLARATION

I **SHIFANA FATHIMA .V** hereby declare that the Professional Training Report (from 2nd Dec 2021 to 13th Jan 2022) for a **period of 30 days** done by me under the guidance of **Er. SIVASANKARAN .R** (Technical manager at Earthonomic engineer) is submitted in partial fulfillment of the requirements for the completion of practical training session.

DATE : 13th January 2022

PLACE : Chennai

SIGNATURE OF CANDIDATE

ACKNOWLEDGEMENT

I am pleased to acknowledge my sincere thanks to Board of Management of **SATHYABAMA** for their kind encouragement in doing this project and for completing it successfully. I am grateful to them.

I convey my thanks to **Dr. Devyani Gangopadhyay**, Dean and Head of Department , School of building and Environment, Dept. of architecture for providing me necessary support and details at the right time during the progressive training session.

I would like to express my sincere and deep sense of gratitude to **Er. SIVASANKARAN. R / Technical Manager / Earthonomic engineer private limited** for his valuable guidance, suggestions and constant encouragement paved way for the successful completion of my project work. My sincere thanks to **Ar.Sheetal Amraotkar** Professional Training Coordinator for her motivation and guidance.

I wish to express my thanks to all Teaching and Non-teaching staff members of the Department of Architecture who were helpful in many ways for the completion of the project.

Also thanks to, Er. Sivasankaran .R / Earthonomic engineer private limited, Adyar, Chennai.

CONFIRMATION AND COMPLETION LETTER

Earthonomic Engineers Private Limited

Registered office: F2 Ashok Castle, 47, 12th Avenue

Ashok Nagar, Chennai – 600083

Email: info@earthonomic.com

Website: www.earthonomic.com



Internship Confirmation Letter

Dear Ms.Shifana Fathima.V,

We would like to confirm that your application for internship for the position of Sustainability Architect in Green Buildings and Simulation department has been accepted. Here are the terms of internship while working with the Company:

1. Duration of internship will be from December 1st, 2021 to January, 11th, 2022.
2. You will be designated as "intern trainee". This position is not open to any remunerative or other benefits from the company.
3. During the internship, we request you to abide by the code of conduct of the company. We request you to also sign the adjoining NDA with this letter as you might be exposed to client sensitive information.

You are requested to submit your acceptance to the terms mentioned above as confirmation of your internship.

Please feel to get in touch with us for any further information.

For Earthonomic Engineers,



Girish R Visvanathan

Director- Technical

Date: 15th November, 2021

Place: Chennai

Earthonomic Engineers Private Limited

Registered office: F2 Ashok Castle, 47, 12th Avenue

Ashok Nagar, Chennai – 600083

Email: info@earthonomic.com

Website: www.earthonomic.com



Internship Certificate

This is to certify that **Ms.Shifana Fathima.V.**, final Year Department of Sustainable Architecture, Satyabama Institute of Science and Technology, Chennai has successfully completed her internship at our organization from December 1st, 2021 to January, 13th, 2022.

During the duration of her internship, she had exposure to industrial and market operations apart from subject matter expertise. She has been sincere and a quick learner of processes and practices required to function efficiently in a corporate environment.

We wish her the best for all future endeavours.



Girish R Visvanathan

Director- Technical

Date: 13th January, 2022

Place: Chennai

WEEKLY REPORTS - Week 1 and 2


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 www.sathyabama.ac.in
 

DEPARTMENT OF ARCHITECTURE
M. Arch (Sustainable Architecture)
Continuous Assessment Report for Professional training
 (Continuous progress report of the trainee architect/Project Manager for the period of 30 working days in the office to be submitted to HOD by the Trainee attending the training session)

1. Name of the office / organization : Earthonomic engineers

2. Address & Contact Number : Yamuna homes, B-4, 4th Street, Parameshwari nagar, Adyar, Chennai, Tamil nadu – 600020 Ph. 6379181440

3. Name of the student : Shifana fathima .V

4. Duration : From 02.12.2021 To 10.12.2021

5. Total No. of days : 8 days

6. Evaluation of Performance criteria shall be on

* Note: Kindly grade the student as per his/her overall performance in the office during the assessment month; which will be converted to the allotted 200 marks by the department.

Description of works	Excellent	Good	Fair	Poor	NA
Understanding of office culture and methodology		✓			
Active Participation in the Project activities	✓				
Documentation and tracking of project	✓				
Presentation Skills developed	✓	✓			
Understanding of construction details & techniques			✓		
Participation and contribution in project meetings		✓			✓
Understanding of codes and standards		✓			
Schedule preparation & tracking activities	✓				
Preparation / Management of drawings	✓				
Learning / Application of software in Projects	✓				
Preparation of concept for projects	✓				
Site Management / Discussion with clients					✓
Overall Grading*	A'				

(A – 8.0, B – 7.0, C – 6.0, D – 5.5, E – 5.0, F – <5)

7. Any other Remarks : _____

8. Signature of the Head of the Office / Organization (With Seal)





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2. Address & Contact Number : Yamuna homes, B-4, 4th Street, Parameshwari nagar, Adyar, Chennai, Tamil nadu – 600020 Ph. 6379181440

3. Name of the student : Shifana fathima .V

4. Duration : From 13.12.2021 To 18.12.2021

5. Total No. of days : 6 days

6. Evaluation of Performance criteria shall be on

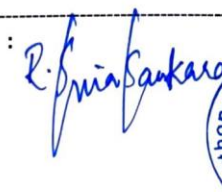
* Note: Kindly grade the student as per his/her overall performance in the office during the assessment month; which will be converted to the allotted 200 marks by the department.

Description of works	Excellent	Good	Fair	Poor	NA
Understanding of office culture and methodology	✓				
Active Participation in the Project activities	✓				
Documentation and tracking of project	✓				
Presentation Skills developed	✓				
Understanding of construction details & techniques		✓			
Participation and contribution in project meetings					✓
Understanding of codes and standards		✓			
Schedule preparation & tracking activities					✓
Preparation / Management of drawings					✓
Learning / Application of software in Projects	✓				
Preparation of concept for projects		✓			
Site Management / Discussion with clients					✓
Overall Grading*	A'				

(A – 8.0, B – 7.0, C – 6.0, D – 5.5, E – 5.0, F – <5)

7. Any other Remarks : _____

8. Signature of the Head of the Office / Organization (With Seal)




WEEKLY REPORTS - Week 3 and 4



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DEPARTMENT OF ARCHITECTURE
M. Arch (Sustainable Architecture)

Continuous Assessment Report for Professional training

(Continuous progress report of the trainee architect/Project Manager for the period of 30 working days in the office to be submitted to HOD by the Trainee attending the training session)

1. Name of the office / organization : Earthnomic engineers
2. Address & Contact Number : Yamuna homes, B-4, 4th Street, Parameshwari nagar, Adyar, Chennai, Tamil nadu - 600020 Ph. 6379181440
3. Name of the student : Shifana fathima .V
4. Duration : From 20.12.2021 To 24.12.2021
5. Total No. of days : 5 days
6. Evaluation of Performance criteria shall be on

* Note: Kindly grade the student as per his/her overall performance in the office during the assessment month; which will be converted to the allotted 200 marks by the department.

Description of works	Excellent	Good	Fair	Poor	NA
Understanding of office culture and methodology	✓				
Active Participation in the Project activities	✓				
Documentation and tracking of project	✓				
Presentation Skills developed	✓				
Understanding of construction details & techniques		✓			
Participation and contribution in project meetings					✓
Understanding of codes and standards		✓			
Schedule preparation & tracking activities					✓
Preparation / Management of drawings					✓
Learning / Application of software in Projects	✓				
Preparation of concept for projects		✓			
Site Management / Discussion with clients					✓
Overall Grading*	A				

(A - 8.0, B - 7.0, C - 6.0, D - 5.5, E - 5.0, F - <5)

7. Any other Remarks :

8. Signature of the Head of the Office / Organization (With Seal)

R. Sankaran
Earthnomic Engineers Pvt. Ltd.
Chennai
600 083



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DEPARTMENT OF ARCHITECTURE
M. Arch (Sustainable Architecture)

Continuous Assessment Report for Professional training

(Continuous progress report of the trainee architect/Project Manager for the period of 30 working days in the office to be submitted to HOD by the Trainee attending the training session)

1. Name of the office / organization : Earthnomic engineers
2. Address & Contact Number : Yamuna homes, B-4, 4th Street, Parameshwari nagar, Adyar, Chennai, Tamil nadu - 600020 Ph. 6379181440
3. Name of the student : Shifana fathima .V
4. Duration : From 27.12.2021 To 30.12.2021
5. Total No. of days : 4 days
6. Evaluation of Performance criteria shall be on

* Note: Kindly grade the student as per his/her overall performance in the office during the assessment month; which will be converted to the allotted 200 marks by the department.

Description of works	Excellent	Good	Fair	Poor	NA
Understanding of office culture and methodology	✓				
Active Participation in the Project activities	✓				
Documentation and tracking of project	✓				
Presentation Skills developed	✓				
Understanding of construction details & techniques					✓
Participation and contribution in project meetings					✓
Understanding of codes and standards		✓			
Schedule preparation & tracking activities					✓
Preparation / Management of drawings	✓				
Learning / Application of software in Projects	✓				
Preparation of concept for projects	✓				
Site Management / Discussion with clients					✓
Overall Grading*	A				

(A - 8.0, B - 7.0, C - 6.0, D - 5.5, E - 5.0, F - <5)

7. Any other Remarks :

8. Signature of the Head of the Office / Organization (With Seal)

R. Sankaran
Earthnomic Engineers Pvt. Ltd.
Chennai
600 083

WEEKLY REPORTS - Week 5



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1. Name of the office / organization : Earthonomic engineers

2. Address & Contact Number : Yamuna homes, B-4, 4th Street, Parameshwari nagar, Adyar, Chennai, Tamil nadu – 600020 Ph. 6379181440

3. Name of the student : Shifana fathima .V

4. Duration : From 3.01.2022 To 12.01.2022

5. Total No. of days : 8 days.

6. Evaluation of Performance criteria shall be on

* Note: Kindly grade the student as per his/her overall performance in the office during the assessment month; which will be converted to the allotted 200 marks by the department.

Description of works	Excellent	Good	Fair	Poor	NA
Understanding of office culture and methodology	✓				
Active Participation in the Project activities	✓				
Documentation and tracking of project	✓				
Presentation Skills developed	✓				
Understanding of construction details & techniques					✓
Participation and contribution in project meetings					✓
Understanding of codes and standards		✓			
Schedule preparation & tracking activities					✓
Preparation / Management of drawings	✓				
Learning / Application of software in Projects	✓				
Preparation of concept for projects		✓			
Site Management / Discussion with clients					✓
Overall Grading*	<u>A'</u>				

(A – 8.0, B – 7.0, C – 6.0, D – 5.5, E – 5.0, F – <5)

7. Any other Remarks : _____

8. Signature of the Head of the Office / Organization (With Seal) : 



WORK DIARY

2 nd to 8 th Dec	Factory at Chennai	3D model, Understanding GRIHA manual (existing building), Similarities in GRIHA & IGBC. Model the documentation presentation, Site observation report & Calculation.
9 th to 14 th Dec	Guest house at Andhra Pradesh	Feasibility report, Occupancy schedule and calculations.
15 th to 20 th Dec	Nature retreat center at Chennai	Sustainability, framing basic requirements and conceptual planning.
21 st Dec to 7 th Jan	It park at Chennai	With respect to each credit, the calculation and documentations were done.
10 th to 13 th Jan	Apartment at Andhra Pradesh	Day lighting analysis of regularly occupied spaces with IES software, Site outdoor view calculation and other miscellaneous works.

Chief Architects /
Engineer signature :
Office seal :



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reason for choosing

01

HISTORY OF THE FIRM
Brief about the firm
and the scope of
works handled

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PROJECTS
4 project in total will
be discussed

03

CRITICAL OVERVIEW
Overall
understanding and
experience explained

04

ABOUT THE FIRM

- FIRM NAME : Earthonomic engineer private limited
- MANAGER : Mr. Girish R Visvanathan
- TEAM : Mr. Shiva shankar and Mr. Prabhakaran
- SCOPE OF WORKS HANDLED : Green rating certifications and organic farming strategies.

REASON FOR CHOOSING THE FIRM

- INTERESTED IN LEARNING :
- Practical approach towards the application of rating systems
- Several calculations involved.

QUESTIONS ASKED TO THE MANAGER FOR CLARIFICATION

- What are the benefits to the clients in using the rating systems ?
- How do you generally convince the client to agree to it ?
- What is the approximate cost in obtaining a rating system for a project ?
- What is the most challenging project you had to deal with ?
- What is the accuracy levels in terms of simulation & Existing lighting levels ?

ABOUT THE FIRM – EARTHONOMIC ENGINEER PRIVATE LIMITED



EARTH + ECONOMIC = EARTHONOMIC
A young team of 3 engineers

“It is a practical application of basic economic principles and the needs of humans and Earth together”.

Their goal is to **transform peoples perception** of “environment is cost” Going beyond compliance **saves cost** and also **generates revenue**.

SERVICES OFFERED ARE



Green building
Certification



Smart
landscaping



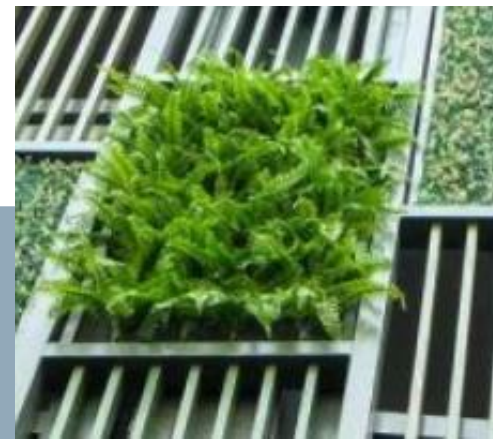
HVAC designs



Lighting design
consultancy



Net zero &
renewable energy



IOT and
automation

- IGBC
- GRIHA
- Green Co
- ECBC
- LEED
- WELL and
- ESTIDAMA

Majorly worked on this, In preliminary feasibility documentation

IMPORTANCE OF GREEN BUILDING AND CERTIFICATION

- **Buildings** are responsible for **39% of annual GHG emission and 40% of raw material consumption** & due to the **increase in C02 emission**, extreme climate changes are experienced.
- So, adopting green building is **definitely not an option** but an effort for future generation, they **also have many benefits** such as energy efficiency, impact of buildings on human health, operation & maintenance.
- Clients are profit from higher occupancy rate apart from the above benefits.

SOURCE : <https://www.unep.org/news-and-stories/press-release/building-sector-emissions-hit-record-high-low-carbon-pandemic>

PANEL MANUFACTURING FACTORY AT CHENNAI

PROJECT - 1

Building typology – Factory (Panel manufacturing factory)

Location – Chennai

Total site area – 26000 Sqm (Existing)

Requirement - Both GRIHA (Existing building) and IGBC (Green factory) rating certification.

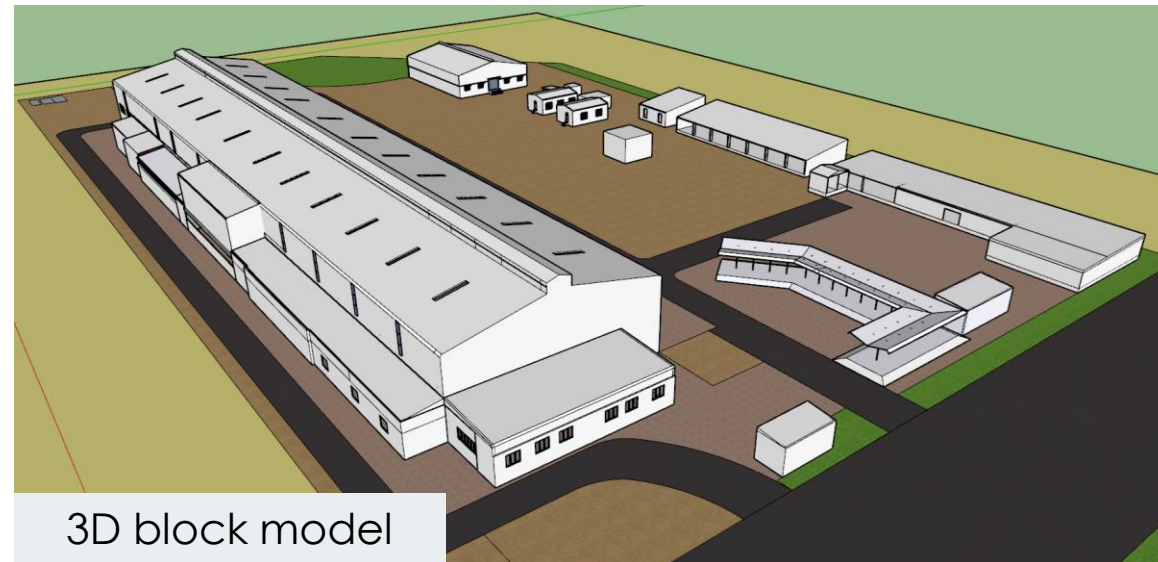
Step – 1: 3D model has been created, in order to understand the **built vs. open** in the existing and would create more **opportunity to design** what is required by the client.



Existing top view

Issues identified at present

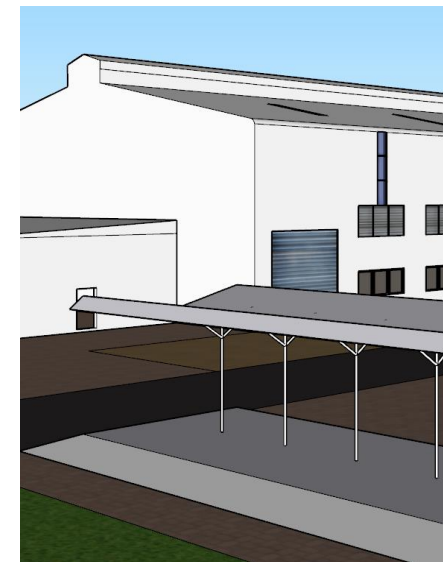
1. Finished goods and wastes are piled up on the site.
2. Proper waste management – lacked.
3. Additional spaces (Storage spaces) required.
4. Plantation and proper pathways required.
5. Overall site management required.



3D block model



3D block model



Existing view

1



2



3

Step 2 : Similar requirement observed in both GRIHA and IGBC .

CRITERIA	GRIHA EB	IGBC GF
Basic Amenities	500m any 5 services – 1 Point. - Grocery store - Pharmacy - Bank/ATM - Park - Restaurant - Community center - Gym - Public transport or - Metro station	(Any 3) 2Km – 1 Point - Grocery - Bank/ATM - School - Pharmacy - Post office. - Multi-purpose hall - Fire station - Medical clinic/Hospital/Dental - Electricity/water utility bills payment counter - Stationery (Any 3) in site – 1 Point - Canteen, - Cyber café - Lockers & showers - Guest house - Crèche - first aid
Access to public transport		1Km walking railway station or 500m walking to bus – 1 Point. - Housing for 40% of the employee in 2Km walking – 2 Point.
CFC free - Mandatory	- Insulation, HVAC – Free of CFC & HCFC - Halon-free firefighting equipment.	HVAC - CFC free
Non-fossil fuel vehicle	Collective transport (electrical parking, pooled vehicle, bicycle parking & shuttle services) – 1 point.	5% of the parking facility non-fossil fuel in site. – 1 Point.
UHIE	25% of the exposed site & roof (SRI >50) – 1 Point. 50% of the exposed site & roof (SRI >50) – 2 Points.	- Cover 50% of the exposed roof area with high albedo roof or 50% vegetation cover in roof. – 2 Points. 75% of the parking cover (by roof or trees) – 2 Points.
Maintenance	Eco-friendly house keeping (1 Point)	
Differently abled	1 parking space for 400 ppl , ramp, entrance access, toilet – 2 Points	

Day lighting	DF (office general – 1.9%) at least 25% of all the living area should meet – 2 points	Minimum average daylight factor of 2% of at least 50% of the total floor area. <table><tr><th>Percentage of Lighting</th><th>Points</th></tr><tr><td>≥ 50%</td><td>2</td></tr><tr><td>≥ 75%</td><td>4</td></tr><tr><td>≥ 95%</td><td>6</td></tr></table>	Percentage of Lighting	Points	≥ 50%	2	≥ 75%	4	≥ 95%	6																																				
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Energy	Basic metering - Mandatory - Utility grid - On-site renewable energy - DG sets Advanced - Credit - Lighting (Indoor & Outdoor) - water pumping Points will be awarded only if they are Smart meters.	Separate meter for process & non-process Loads and any 4 meters - A/c - Internal light - External light - Chilled water consumption - Municipal water pumping - Grey water pumping - Water pumping for landscape 1 point for every 2 meters (2 Points in total).																																												
Water – Sub meters	Basic metering – Mandatory - Municipal supply - Tank & STP Advanced - Credit - Irrigation - Fresh water consumption - waste water consumption - rainwater.	- Not required -																																												
Comfort	Temperature, RH & Co2 level }	- Not required –																																												
On-site renewable energy	Alternative – I Alternative - II <table><tr><th>Percentage offset for daytime occupied commercial buildings</th><th>Points</th><th>Percentage offset of energy consumption</th><th>Points</th></tr><tr><td>2.5% (only On-site)</td><td>Mandatory</td><td>10%</td><td>Mandatory</td></tr><tr><td>5%</td><td>3</td><td>20%</td><td>3</td></tr><tr><td>10%</td><td>5</td><td>40%</td><td>5</td></tr><tr><td>15%</td><td>7</td><td>60%</td><td>7</td></tr><tr><td>20%</td><td>10</td><td>80%</td><td>10</td></tr><tr><td>25%</td><td>15</td><td>100%</td><td>15</td></tr></table>	Percentage offset for daytime occupied commercial buildings	Points	Percentage offset of energy consumption	Points	2.5% (only On-site)	Mandatory	10%	Mandatory	5%	3	20%	3	10%	5	40%	5	15%	7	60%	7	20%	10	80%	10	25%	15	100%	15	On site -<table><tr><th>Percentage of annual non-process energy consumption</th><th>Points</th></tr><tr><td>≥ 5 %</td><td>2</td></tr><tr><td>≥ 10 %</td><td>4</td></tr><tr><td>≥ 15 %</td><td>6</td></tr></table> Off-site -<table><tr><th>Percentage of annual non-process energy consumption</th><th>Points</th></tr><tr><td>50 %</td><td>2</td></tr><tr><td>75%</td><td>4</td></tr><tr><td>100 %</td><td>6</td></tr></table>	Percentage of annual non-process energy consumption	Points	≥ 5 %	2	≥ 10 %	4	≥ 15 %	6	Percentage of annual non-process energy consumption	Points	50 %	2	75%	4	100 %	6
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Water Consumption reduction	30% below the base case - 3 Points <table><tr><th>Fixture / Fitting</th><th>Flow rate</th></tr><tr><td>Water closets (solids)</td><td>9 lpm</td></tr><tr><td>Kitchen faucets</td><td>10 lpm</td></tr><tr><td>Conventional urinals (female)</td><td>4 lpm</td></tr><tr><td>Conventional urinals (male)</td><td>4 lpm</td></tr><tr><td>Showers</td><td>10 lpm</td></tr><tr><td>Lavatory faucets</td><td>10 lpm</td></tr></table>	Fixture / Fitting	Flow rate	Water closets (solids)	9 lpm	Kitchen faucets	10 lpm	Conventional urinals (female)	4 lpm	Conventional urinals (male)	4 lpm	Showers	10 lpm	Lavatory faucets	10 lpm	<table><tr><th>S.No</th><th>Fixtures</th><th>Units</th><th>Baseline Flow Rates</th></tr><tr><td>1</td><td>Water Closets</td><td>LPF</td><td>6 / 3</td></tr><tr><td>2</td><td>Urinals</td><td>LPF</td><td>3.0</td></tr><tr><td>3</td><td>Showers</td><td>LPM</td><td>9.5*</td></tr><tr><td>4</td><td>Faucets</td><td>LPM</td><td>8.3*</td></tr></table> 4 Points <table><tr><th>Percentage of Potable Water Savings over Baseline</th><th>Points</th></tr><tr><td>≥ 20 %</td><td>2</td></tr><tr><td>≥ 30 %</td><td>4</td></tr></table>	S.No	Fixtures	Units	Baseline Flow Rates	1	Water Closets	LPF	6 / 3	2	Urinals	LPF	3.0	3	Showers	LPM	9.5*	4	Faucets	LPM	8.3*	Percentage of Potable Water Savings over Baseline	Points	≥ 20 %	2	≥ 30 %	4
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Irrigation system	Water-efficient irrigation system by 50% from GRIHA base case – 2 Points.	- Central shutoff valve for the irrigation system - Moisture sensor control - Turf & each type of bedding segregated into independent zones based on watering. - At least 50% of landscape planting beds with drip irrigation system. - Time based controller for valves. - Pressure regulating device - Any other innovative methods for watering. 1 Point for every two features (total points – 2)																																								
Rain water harvesting	- Only Roof rainwater harvesting – 2 Points 100% of the catchment area – 4 Points	<table><tr><th>Rainwater Harvesting System to capture / recharge</th><th>Points</th></tr><tr><td>≥ 75% runoff</td><td>3</td></tr><tr><td>≥ 95% runoff</td><td>6</td></tr></table>	Rainwater Harvesting System to capture / recharge	Points	≥ 75% runoff	3	≥ 95% runoff	6																																		
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Waste water treatment	- On site STP (100% of grey water) – 2 Points - STP (100% of grey and black water) – 4 Points	On-site waste water treatment to treat at least 75% of the waste water. <table><tr><th>Treatment of non-process water</th><th>Points</th></tr><tr><td>≥ 75 %</td><td>2</td></tr><tr><td>≥ 95 %</td><td>4</td></tr></table>	Treatment of non-process water	Points	≥ 75 %	2	≥ 95 %	4																																		
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Waste management	- Segregation of waste at source (multicolored dustbin) – 1 Point - Dedicated space for treatment/recycling – 1 Point - Tie ups with waste recyclers for recycling metal, paper, plastic, glass, e-waste etc. – 1 Point. - Organic treatment (kitchen or biogas) – 2 Point.	Mandatory - Facility to segregate at least 5 of the following non process waste generated. - Organic waste - Plastic - Paper, paperboard - Glass - Metals “e” Waste - Lamps - Batteries																																								

Step 3: Observations from the site which needed attention.

Site clearance and waste management:

1. Site needs to be **free of unwanted waste materials** and newly arrived products.
2. Centralized **scrap yard** should be provided.
3. **Source separation** of waste needs to be practiced in all the areas of the site, **Organic waste** (Kitchen & landscape) should be **decomposed, recycling of recyclable wastes** such as metal, paper, plastic, glass, rock wool, e-waste etc., multicolored dustbins required.
4. Dedicated space should be provided for different waste **before treatment or recycling.**
5. Improper waste management can **cause leachate** (polluting the ground water table), soil and air contamination and hazardous to human health.
6. This is mandatory in both GRIHA and IGBC.

Finished goods storage required:

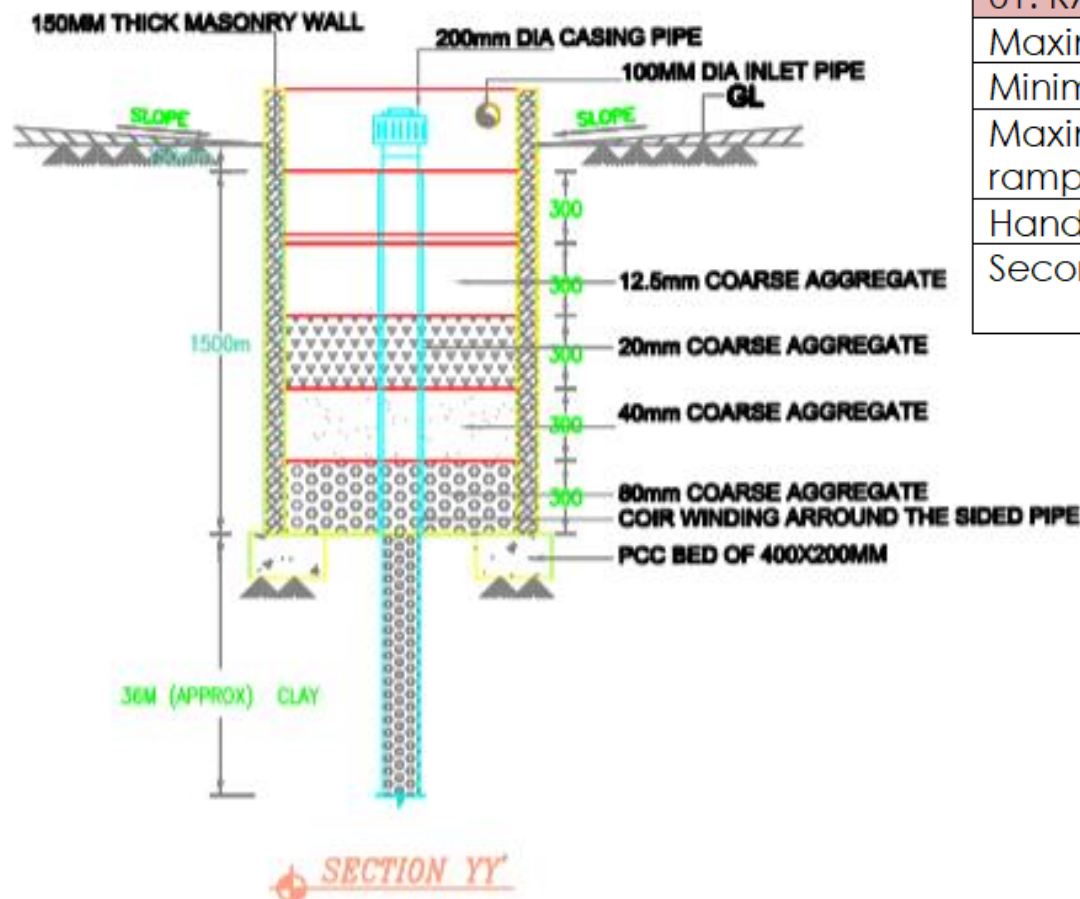
1. **Proper storage space** should be assigned for the placement of finished goods.
2. Improper placement of the fresh goods can **damage** them as they are **exposed to ambient.**

Landscape needs to be improved:

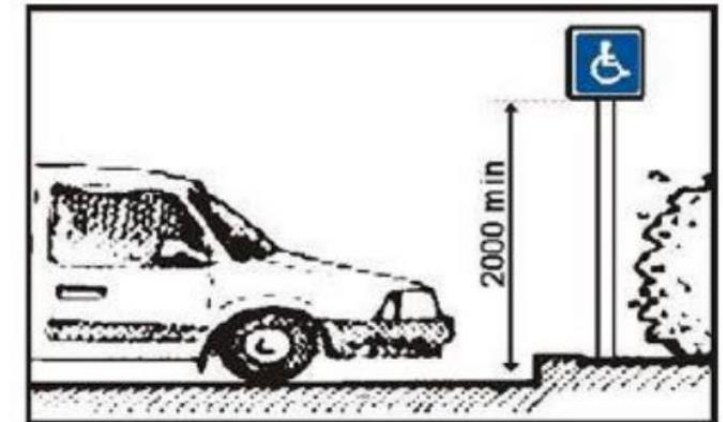
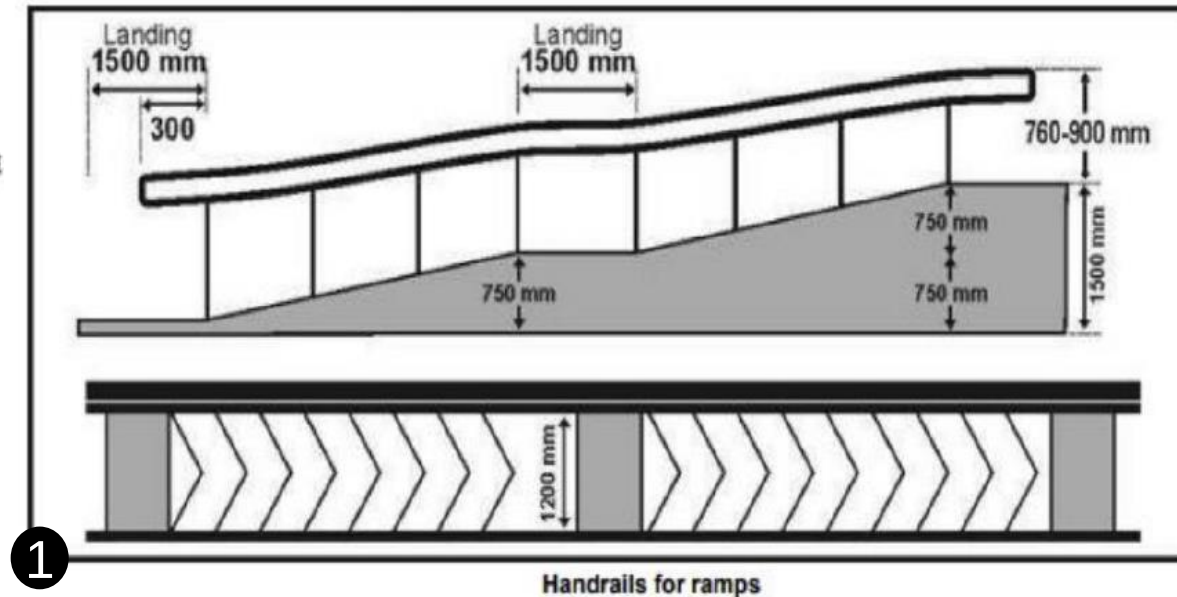
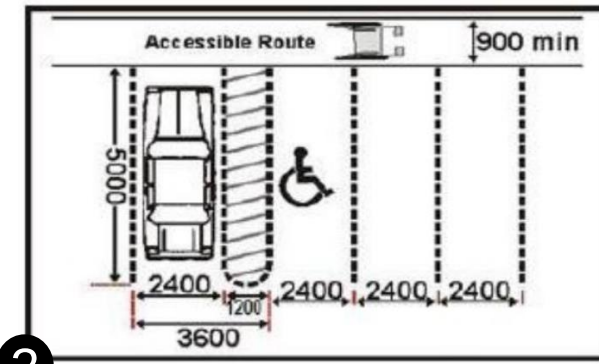
1. Proper **maintenance of the landscape** is required.
2. Turf (landscape consuming large quantities of water) areas should be **minimized.**
3. Native and **draught tolerant species** should be incorporated in order to gain points in rating system as well as aesthetic purpose.

Repurposing of testing facility area:

Testing facility should either be maintained for later use or repurposed to some other area which is in need.



01. RAMP – Refer Fig : 1	
Maximum gradient	1:12
Minimum width of the ramp	900mm
Maximum length of the ramp	9m
Handrail height	850mm (should be on both sides & landing)
Second handrail height	Between 650mm to 750mm above surface of the ramp



Storm water management required :

1. Storm drains needs to **be cleared and maintained annually**.
2. Due to poor maintenance the water movement will be obstructed **and stagnation** will occur.
3. Water stagnation in these drains can cause **unpleasant odor**, affect the health and are very unhygienic.
4. Rain water management is required to achieve **both GRIHA and IGBC rating**.

Sewage treatment plant (STP):

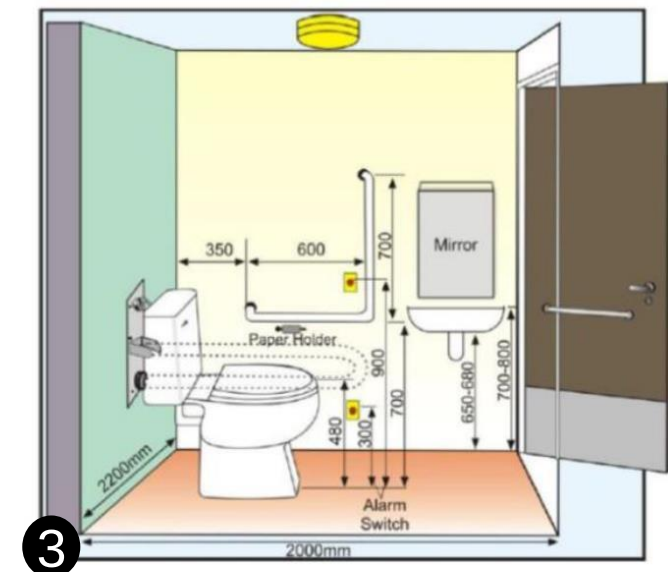
1. Immediate **repair of STP is required**. Treated grey water should be reused in other required areas (Gardening, Toilet flushing etc...).
2. Both GRIHA & IGBC has 4 points respectively for STP.

Universal accessibility:

1. To make the built environment barrier free to all including, persons with disabilities and elderly persons, these should be followed.

02. Parking design - Refer Fig : 2	
Parking bay	2400mm wide
Unloading platform	1200mm

These ramp, parking and toilet for the physically challenged should be designed for both IGBC and GRIHA.



03. Toilet design - Refer Fig: 3	
Size of the toilet	2200 x 2000 mm
Flooring material	Non-slip surface without level difference
Door shutter opening	900mm (Light weight door shutter), door should be outward opening, two-way swing or sliding door or folding door.
Grab bars	40 mm diameter vertical bar up to 700 to 800mm
WC height	450 – 480mm
Urinal height	430mm
Signage	Braille signage at 1400 mm along with illuminated symbol for disabled at 1500mm

Step 4: Comparison of points, rating and mandatory criteria of IGBC and GRIHA.

CRITERIA	IGBC Green factory	GRIHA Existing building																																		
Points Distributed	<table><tr><th>CREDITS</th><th>POINTS</th></tr><tr><td>Site Selection & Planning</td><td>16</td></tr><tr><td>Water Conservation</td><td>21</td></tr><tr><td>Energy Conservation</td><td>23</td></tr><tr><td>Material Conservation</td><td>16</td></tr><tr><td>Indoor Environment Quality</td><td>19</td></tr><tr><td>Innovation</td><td>5</td></tr><tr><td>TOTAL</td><td>100</td></tr></table>	CREDITS	POINTS	Site Selection & Planning	16	Water Conservation	21	Energy Conservation	23	Material Conservation	16	Indoor Environment Quality	19	Innovation	5	TOTAL	100	<table><tr><th>CRITERION</th><th>POINTS</th></tr><tr><td>Site Parameters</td><td>8</td></tr><tr><td>Maintenance & Housekeeping</td><td>17</td></tr><tr><td>Energy</td><td>35</td></tr><tr><td>Water</td><td>25</td></tr><tr><td>Human Health & Comfort</td><td>12</td></tr><tr><td>Social Aspects</td><td>5</td></tr><tr><td>Bonus Points</td><td>4</td></tr><tr><td>TOTAL</td><td>104</td></tr></table>	CRITERION	POINTS	Site Parameters	8	Maintenance & Housekeeping	17	Energy	35	Water	25	Human Health & Comfort	12	Social Aspects	5	Bonus Points	4	TOTAL	104
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Mandatory criteria	1. Local Building Regulations 2. Soil Erosion Control 3. Rain Water Harvesting Roof & Non Roof 4. Water Efficient Plumbing Fixtures 5. Ozone depleting Substances 6. Minimum Energy Performance 7. Segregation of waste ,Post Occupancy 8. Tobacco Smoke Control 9. Minimum fresh Air Requirement 10. Avoid use of asbestos	1. Maintenance 2. HCF and CFC free equipment's 3. Halon free – fire fighting equipment 4. Basic metering requirement 5. Energy consumption 6. Water audit report 7. Smoke free site																																		

Step 5 : Preliminary documentation (IGBC) to observe the points.

CREDIT	CURRENT STATUS
SITE SELECTION AND PLANNING	
Local Building Regulations	1) Factory license 2) NOC for Local body 3) PCB (polychlorinated biphenyls (PCBs)) free certificate 4) Fire
Soil Erosion Control	Drain Maintenance not in place
Contaminated Site Remediation	Site is a green field so, not applicable
Access to Public Transport / Shuttle Services	36 employees – 3 shifts -50% shuttle- Kanchipuram & Sriperumbudur Housing facility for 40% of the employee in 2km distance is not available
Basic Amenities	- 3 Facilities available within 2Km from the site entrance. - 3 facilities available in site.
Natural Topography & Vegetation	Total site area : 7.4 Acres Approx 30% Open Space/green space available – Revamp of landscape required.
Heat Island effect roof & Parking	Plans to change roof – 78 SRI (Factory sheet)- Management discussion. Permanent roof to 75% of the parking is provided SRI to be evaluated.
Non Fossil Fuelling facility for Vehicles	As per discussion, Possible to implement 1 car & 1 bike.
Design for Differently abled	Designs modifications to be made.
Night Sky Pollution reduction	Achieved
WATER CONSERVATION	
Rainwater Harvesting, Roof & Non-roof	Currently no systems in place to harvest rain water.
Water Efficient Plumbing Fixtures	Aerators to be procured for taps and minor modifications to be made in fixtures.
Landscape design	Improvements to be made In landscape area.
Wastewater Treatment	5 KLD . Gardening . Not in use currently
Management of Irrigation Systems	Central shut-off and species segregation is possible. As per discussion, drip irrigation is not possible.
ENERGY EFFICIENCY	
Ozone Depleting Substances	All AC area CFC Free.
Minimum Energy Efficiency	Factory CFL ; Admin – LED Ac – star – Policy to be framed
Optimize energy performance	Possible to achieve
Energy Metering	Possible to implement , As per discussion, sub-metering to be provided.
On Site Renewable Energy	Solar in place – 5 KW approx., Details to be provided by factory team.
Green Power	Vendor details to be shared by consultant team.
Eco friendly DG Sets	OLD DG – NA –Difficult to implement

CREDIT	CURRENT STATUS
MATERIAL CONSERVATION	
Segregation of Waste, Post-occupancy	Pending – Central waste yard to be set up and multi-coloured dustbins to be provided.
Handling of Waste Materials, During Construction	Policies to be made for future expansion, consultant team will assist in policy framing.
Material with recycled content	
Local Materials	
Material Reuse	
Certified wood/ Rapidly renewable building material	
INDOOR ENVIRONMENTAL QUALITY	
Minimum Fresh Air Ventilation	To be assessed in detail. Calculations underway.
Tobacco Smoke Control	Signage and policies to be provided.
Avoid use of asbestos in the building	policies to be provided.
Improved Fresh air ventilation	To be assessed in detail. Calculations underway.
Building Flush out	Achieved
Day lighting	To be assessed in detail. Calculations underway.
Low VOC – materials	Achieved
Occupant Well-being Facilities	To be revamped.
Eco-friendly chemical	Plant confirmed procurement of eco-friendly housekeeping.
Gymnasium	Gym to be set up.

Credits	Points Available	Current Stand	Points Requiring Detailed Analysis	Not Attempted
Site Selection & Planning	16	13	0	3
Water Conservation	21	6	14	1
Energy Conservation	23	6	9	8
Material Conservation	16	16	0	0
Indoor Environment Quality	19	11	8	0
Innovation	5	3	2	0
Total	100	55	33	12

Total credit points current status : **(Certified rating)**
 Points required to achieve silver : +6
 Points required to achieve Gold : +16
 Points required to achieve Platinum : +26

Target rating : Platinum

OBSERVATION & LEARNING

- ✓ To observe the **site and list down** the possible issues in correspondence with the **requirement of the rating**.
- ✓ To understand the **two rating systems and retrieve** the similarities in order to work efficiently.
- ✓ Before involving into time consuming simulations and calculations, **preliminary documentation** is done to understand the basic points are achieved or achievable.

Registration Fee (Rs.)

Category	Registration Fee (Rs)
IGBC Members	25,000
Non Members	30,000

Validity : For 3 years
from the date of
issue

Provisional Certification Fee (Rs.)

Category	Precertification / Provisional Fee (Rs)
IGBC Members	1,95,000
Non Members	2,40,000

Certification Fee (Rs.)

Certification Fee	2,500 sq.m & below	2,501 sq.m to 50,000 sq.m	50,001 sq.m & above
	Fixed rate	Based on sq.m	Fixed rate
Founding Members	1,70,000	Rs. 1,70,000 + Rs. 11.25 per additional sq.m over & above 2,500 sq.m	7,05,000
Annual members	1,80,000	Rs. 1,80,000 + Rs. 11.50 per additional sq.m over & above 2,500 sq.m	7,30,000
Non-members	1,90,000	Rs. 1,90,000 + Rs. 11.50 per additional sq.m over & above 2,500 sq.m	7,40,000

NATURE RETREAT CENTER AT CHENNAI

PROJECT - 2

Building typology – Self sustaining eco – Tourism area

Location – Chennai

Total site area – 100 Acres (404686 Sqm)

Requirement –

- Sustainable eco-tourism should be Developed in a 100 Acre site, To provide the users a different away from the routine urban life and provide them a peaceful get away.
- Apart from the user, this would be beneficial in reducing the UHI and conserving the environment.

FACILITIES OFFERED IN THE ECO – RETREAT CENTRE

ORGANIC FARMING & CULTURAL ENHANCEMENTS

- Preserving forest
- Vegetable produce
- Community kitchen
- Art & Craft
- Cultural workshops
- Goshala
- Bird watch

ENTERTAINMENT & TRAINING FACILITIES

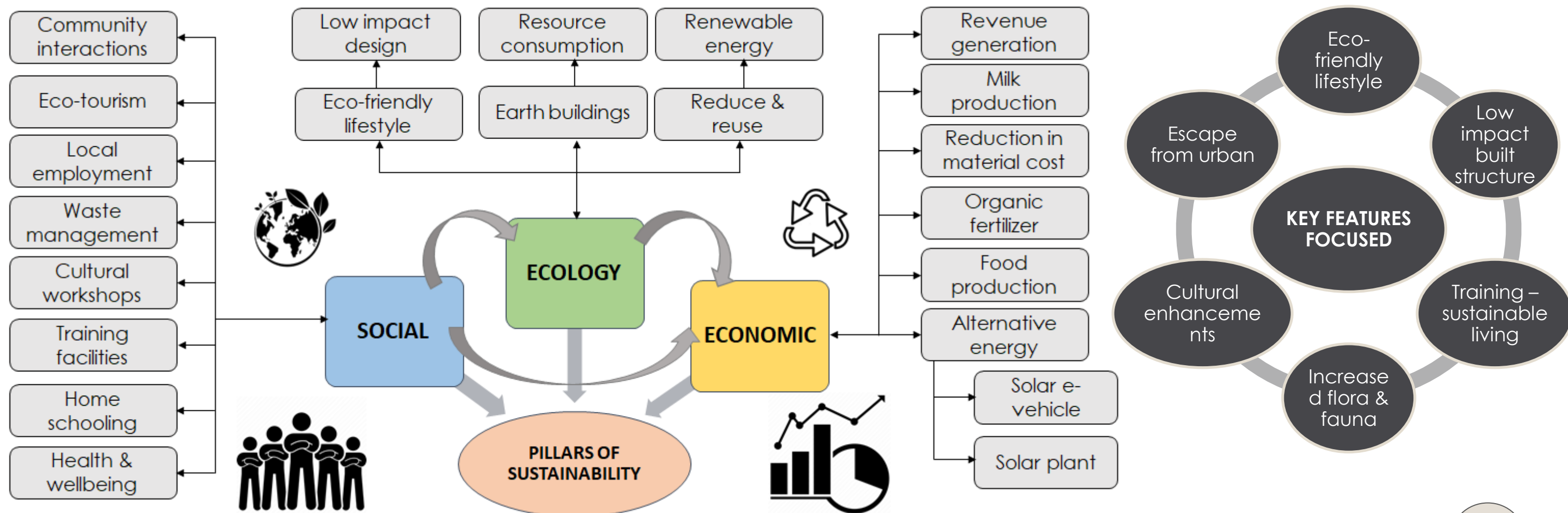
- Adventure sports activities
- Indoor game arena
- Boating facility
- Exhibition space
- Research & Training area
- Star watch
- Butterfly garden
- Maze garden
- Meditation (Zen garden)

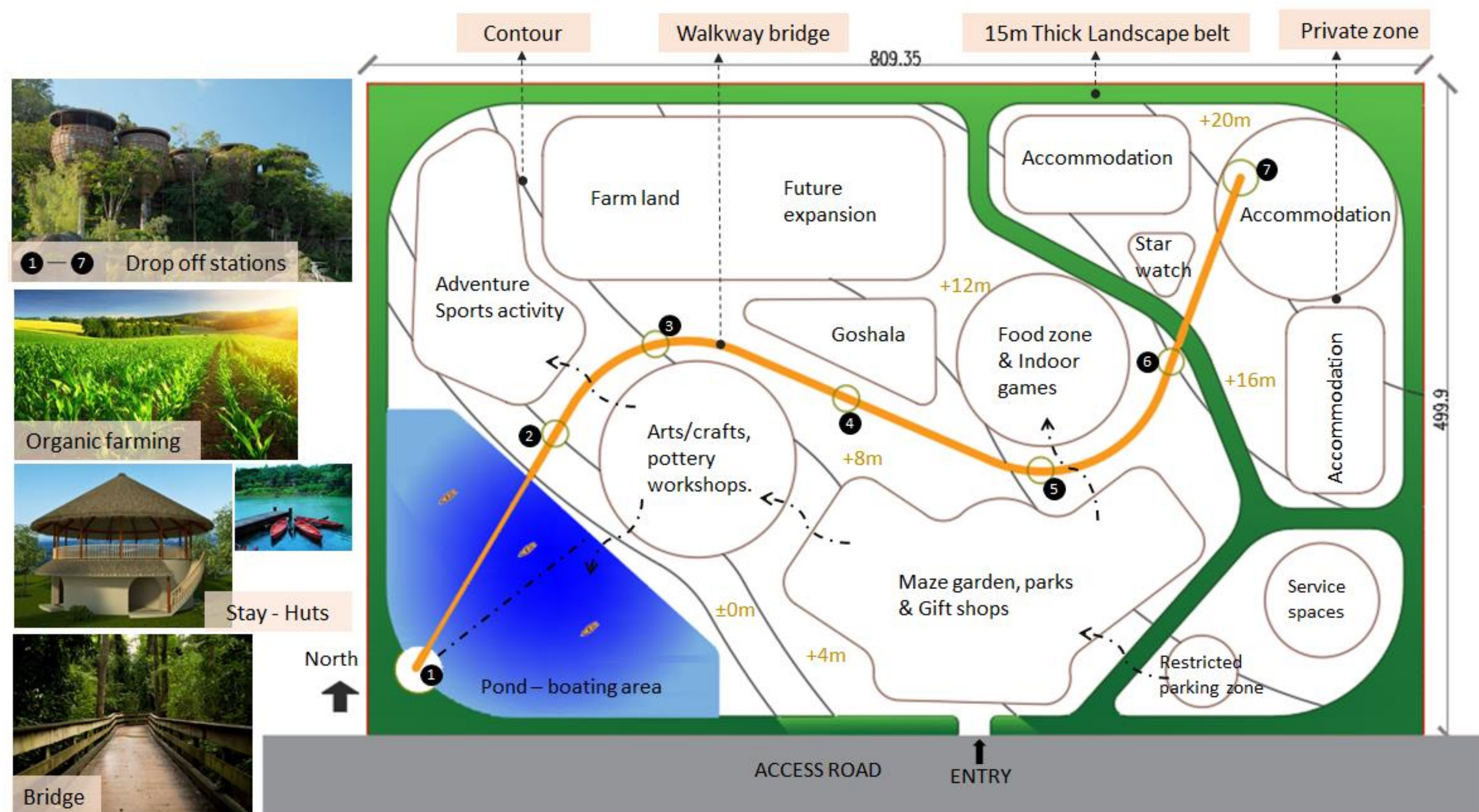
PRIVATE FACILITIES

- Eco-friendly built accommodation structures
- Private huts with pool facilities
- Private gardens
- Spa facility
- Private nature dining
- Yoga space

Experience in the Eco-retreat center

- Socially
- Physically
- Mentally
- Emotionally
- Spiritually joyful





OBSERVATION & LEARNING

- ✓ Finding ways to **satisfy all the pillars of sustainability** and incorporating spaces in regards to that.
- ✓ Seeking ways to connect **each space and activities and mapping** which would **interest the users visiting**.
- ✓ Understanding of a **larger scale** and finding ways to **develop it completely**.
- ✓ Conceptual planning from zoning the area to **private semi private & public** and working with contours.

GUEST HOUSE AT ANDHRA PRADESH

PROJECT - 3

Building typology – Guest House

Location – Andhra Pradesh

Total site area – 2000 Sqm

Built up area – 1200 Sqm (under construction)

Rating followed – IGBC Green Homes

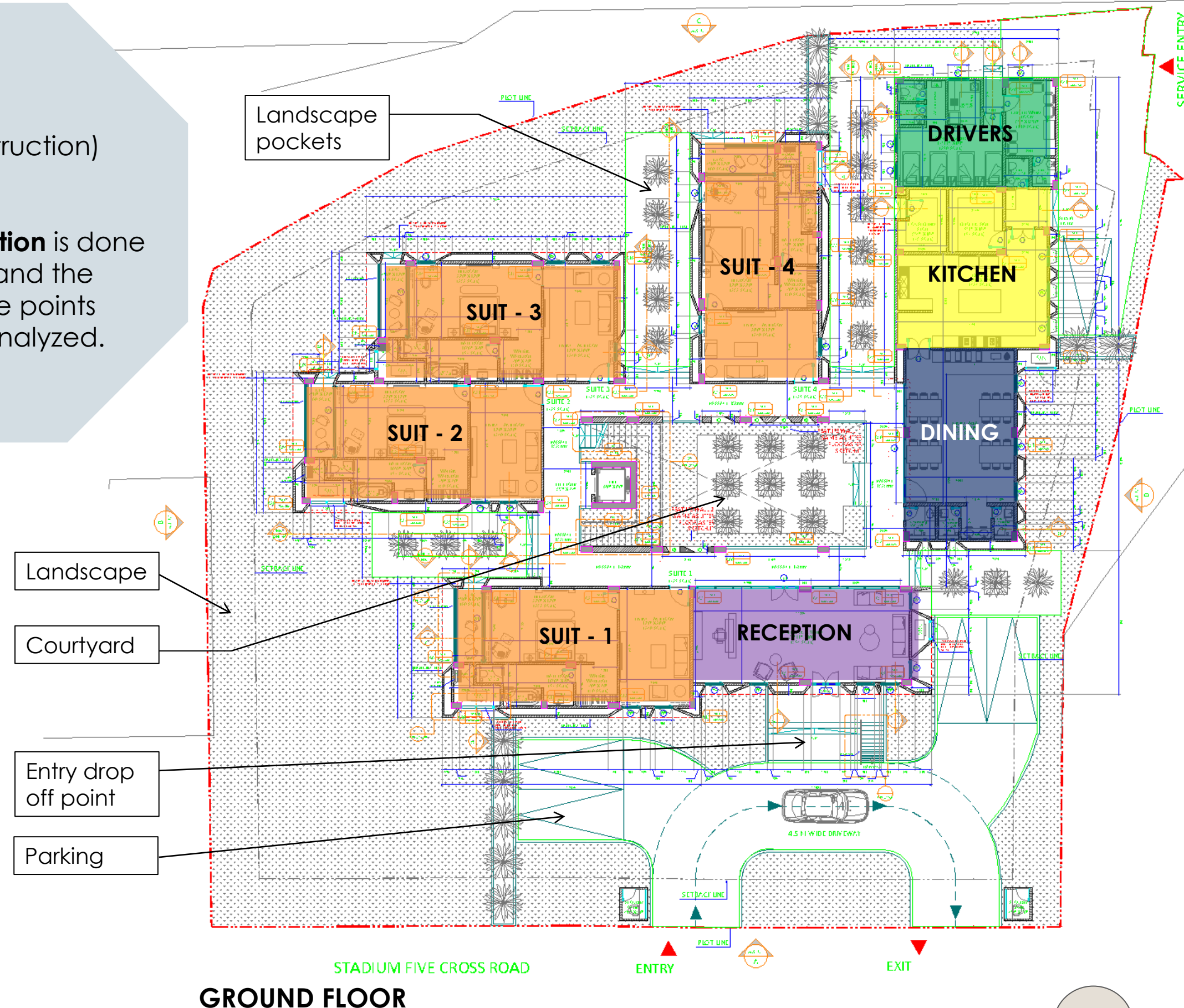
Works done – Preliminary documentation is done along with the **required calculations** and the points obtained are observed and the points required for further assessments are analyzed.

SPACES IN GROUND FLOOR

- Reception
- 4 Suit rooms
- A courtyard
- Dining area
- Kitchen and
- Drivers dorm

SPACES IN FIRST FLOOR

- 4 Suit room and
- Terrace





CALCULATIONS

Ventilation, day lighting, Rainfall run-off, Percolation pit, Energy and Solar panel calculation

LANDSCAPE AREA CALCULATION	
Typology	sq.m
Site Area	2006.27
Planting Area	866.6
Total landscape Area	866.6
Percentage	43%
Achieved Points	2

VENTILATION CALCULATION

- Details

Doors Opening Percentage	100%
Glazed Door	66%
Glass VLT	0.9

WINDOW - DOOR SCHEDULE				
Name	Width	Height	Area	Openable Area
W1	3.65	2.7	9.86	6.60
W2	1.25	2.569	3.21	1.06
W3	1.05	1.5	1.58	0.79
W4	0.90	2.569	2.31	1.50
W5	0.90	0.6	0.54	0.54
D-01	1.20	2.65	3.18	3.18
D-02	1.05	2.65	2.78	2.78
D-03	0.90	2.65	2.39	2.39
D-04	0.75	2.65	1.99	1.99
D-05	0.60	2.65	1.59	1.59
D-06	0.90	2.45	2.21	2.21
D-07	0.60	2.45	1.47	1.47
GLD-1	1.50	2.57	3.86	3.86
GLD-2	1.20	2.57	3.08	3.08
GLD-3	1.50	2.615	3.92	3.92

GROUND FLOOR

Regularly Occupied Spaces	Total Floor Area (Carpet) (Sq.ft)	Total Floor Area (Carpet) (Sq.m)	Window type 1	Window type 2	Window type 3	Window type 4	Window type 5	Window type 6	Glazed Door Type 1	Glazed Door Type 2	Wooden Doors	Operable Window 1 Area	Operable Window 2 Area	Operable Window 3 Area	Operable Window 4 Area	Operable Window 5 Area	Operable Window 6 Area	Operable glazed Door Area Type 1	Operable glazed Door Area Type 2	Operable Wooden Door Area	Total Operable area	Opening to carpet area ratio	Mandatory Requirement to Meet credit point - Fresh Air	Credit Requirement to Meet credit point	Does it meet MR for Fresh Air	Does it meet CR for Fresh Air
Kitchen	400.00	37.16	W5	W5	W5						D-01	0.54	0.54	0.54	0.00	0.00	0.00	0.00	0.00	3.18	4.80	12.92%	8.00%	10.00%	Yes	Yes
Kitchen - Staff Quarters	42.00	3.90	W3									0.79	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.79	20.18%	8.00%	10.00%	Yes	Yes
Reception & Waiting	594.00	55.18	W4	W4	W4	W4	W4	W4	GLD-1	GLD-3		1.50	1.50	1.50	1.50	1.50	1.50	3.86	3.92	0.00	16.79	30.43%	10.00%	13.00%	Yes	Yes
Dining area	480.00	44.59	W4	W4	W4					GLD-2		1.50	1.50	1.50	0.00	0.00	0.00	0.00	3.08	0.00	7.59	17.03%	10.00%	13.00%	Yes	Yes
Staff Quarters	290.00	26.94	W4	W4							D-06	1.50	1.50	0.00	0.00	0.00	0.00	0.00	0.00	2.21	5.21	19.34%	10.00%	13.00%	Yes	Yes
Drivers Waiting	110.00	10.22	W2								D-06	1.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.21	3.26	31.95%	10.00%	13.00%	Yes	Yes
Suite-1 (Bed & Liv)	522.00	48.49	W1	W4	W4							6.60	1.50	1.50	0.00	0.00	0.00	0.00	0.00	0.00	9.61	19.81%	10.00%	13.00%	Yes	Yes
Suite-2 (Bed & Liv)	522.00	48.49	W1	W4	W4							6.60	1.50	1.50	0.00	0.00	0.00	0.00	0.00	0.00	9.61	19.81%	10.00%	13.00%	Yes	Yes
Suite-3 (Bed & Liv)	522.00	48.49	W1	W4	W4	W4	W4					6.60	1.50	1.50	1.50	1.50	0.00	0.00	0.00	0.00	12.61	26.01%	10.00%	13.00%	Yes	Yes
Suite-4 (Bed & Liv)	522.00	48.49	W1	W4	W4	W4						6.60	1.50	1.50	1.50	0.00	0.00	0.00	0.00	0.00	11.11	22.91%	10.00%	13.00%	Yes	Yes

FIRST FLOOR

Regularly Occupied Spaces	Total Floor Area (Carpet) (Sq.ft)	Total Floor Area (Carpet) (Sq.m)	Window type 1	Window type 2	Window type 3	Window type 4	Window type 5	Window type 6	Glazed Door Type 1	Glazed Door Type 2	Wooden Doors	Operable Window 1 Area	Operable Window 2 Area	Operable Window 3 Area	Operable Window 4 Area	Operable Window 5 Area	Operable Window 6 Area	Operable glazed Door Area Type 1	Operable glazed Door Area Type 2	Operable Wooden Door Area	Total Operable area	Opening to carpet area ratio	Mandatory Requirement to Meet credit point - Fresh Air	Credit Requirement to Meet credit point	Does it meet MR for Fresh Air	Does it meet CR for Fresh Air
Suite-1 (Bed & Liv)	522.00	48.49	W1	W4	W4							6.60	1.50	1.50	0.00	0.00	0.00	0.00	0.00	0.00	9.61	19.81%	10.00%	13.00%	Yes	Yes
Suite-2 (Bed & Liv)	522.00	48.49	W1	W4	W4							6.60	1.50	1.50	0.00	0.00	0.00	0.00	0.00	0.00	9.61	19.81%	10.00%	13.00%	Yes	Yes
Suite-3 (Bed & Liv)	522.00	48.49	W1	W4	W4	W4	W4					6.60	1.50	1.50	1.50	1.50	0.00	0.00	0.00	0.00	12.61	26.01%	10.00%	13.00%	Yes	Yes
Suite-4 (Bed & Liv)	522.00	48.49	W1	W4	W4	W4						6.60	1.50	1.50	1.50	0.00	0.00	0.00	0.00	0.00	11.11	22.91%	10.00%	13.00%	Yes	Yes

VENTILATION REQUIREMENT	
Points Required	2
Points Achieved	2

According to the ventilation requirement, Ground and first floor **achieve more than** the mandatory and credit requirements.

GROUND FLOOR

DAYLIGHT CALCULATION

Regularly Occupied Spaces	Total Floor Area (Carpet) (Sq.ft)	Total Floor Area (Carpet) (Sq.m)	Window type 1	Window type 2	Window type 3	Window type 4	Window type 5	Window type 6	Glazed Door Type 1	Glazed Door Type 2	Window 1 Area	Window 2 Area	Window 3 Area	Window 4 Area	Window 5 Area	Window 6 Area	Total Window glazed Area	Glazed Door area Type 1	Glazed Door area Type 2	Total Glazed Door area	Total glazed area	Daylight Factor	Daylight Factor for MR and Credit	Occupied Area Meeting daylight factor	Percentage of Regularly occupied Area Meeting daylight factor
Kitchen	400.00	37.16	W5	W5	W5						0.54	0.54	0.54	0.00	0.00	0.00	1.62	0.00	0.00	0.00	1.62	0.78	2.00	0.00	90%
Kitchen - Staff Quarters	42.00	3.90	W3								1.58	0.00	0.00	0.00	0.00	0.00	1.58	0.00	0.00	0.00	1.58	7.27	2.00	3.90	
Reception & Waiting	594.00	55.18	W4	W4	W4	W4	W4	W4	GLD-1	GLD-3	2.31	2.31	2.31	2.31	2.31	2.31	6.94	2.31	3.86	3.92	10.86	3.54	1.00	55.18	
Dining area	480.00	44.59	W4	W4	W4					GLD-2	2.31	2.31	2.31	0.00	0.00	0.00	6.94	0.00	0.00	3.08	10.02	4.04	1.00	44.59	
Staff Quarters	290.00	26.94	W4	W4							2.31	2.31	0.00	0.00	0.00	0.00	4.62	0.00	0.00	0.00	4.62	3.09	1.00	26.94	
Drivers Waiting	110.00	10.22	W2								3.21	0.00	0.00	0.00	0.00	0.00	3.21	0.00	0.00	0.00	3.21	5.66	1.00	10.22	
Suite-1 (Bed & Liv)	522.00	48.49	W1	W4	W4						9.86	2.31	2.31	0.00	0.00	0.00	14.48	0.00	0.00	0.00	14.48	5.37	1.00	48.49	
Suite-2 (Bed & Liv)	522.00	48.49	W1	W4	W4						9.86	2.31	2.31	0.00	0.00	0.00	14.48	0.00	0.00	0.00	14.48	5.37	1.00	48.49	
Suite-3 (Bed & Liv)	522.00	48.49	W1	W4	W4	W4	W4				9.86	2.31	2.31	2.31	2.31	0.00	14.48	0.00	0.00	0.00	14.48	5.37	1.00	48.49	
Suite-4 (Bed & Liv)	522.00	48.49	W1	W4	W4	W4					9.86	2.31	2.31	2.31	0.00	0.00	14.48	0.00	0.00	0.00	14.48	5.37	1.00	48.49	

DF = (Total glazed * 0.9(Vlt) * 0.2*100)/Total carpet area

FIRST FLOOR

Standard

Regularly Occupied Spaces	Total Floor Area (Carpet) (Sq.ft)	Total Floor Area (Carpet) (Sq.m)	Window type 1	Window type 2	Window type 3	Window type 4	Window type 5	Window type 6	Glazed Door Type 1	Glazed Door Type 2	Window 1 Area	Window 2 Area	Window 3 Area	Window 4 Area	Window 5 Area	Window 6 Area	Total Window glazed Area	Glazed Door area Type 1	Glazed Door area Type 2	Total Glazed Door area	Total glazed area	Daylight Factor	Daylight Factor for MR and Credit	Occupied Area Meeting daylight factor	Percentage of Regularly occupied Area Meeting daylight factor
Suite-1 (Bed & Liv)	522.00	48.49	W1	W4	W4						9.86	2.31	2.31	0.00	0.00	0.00	14.48	0.00	0.00	0.00	14.48	5.37	1.00	48.49	100%
Suite-2 (Bed & Liv)	522.00	48.49	W1	W4	W4						9.86	2.31	2.31	0.00	0.00	0.00	14.48	0.00	0.00	0.00	14.48	5.37	1.00	48.49	
Suite-3 (Bed & Liv)	522.00	48.49	W1	W4	W4	W4	W4				9.86	2.31	2.31	2.31	2.31	0.00	14.48	0.00	0.00	0.00	14.48	5.37	1.00	48.49	
Suite-4 (Bed & Liv)	522.00	48.49	W1	W4	W4	W4					9.86	2.31	2.31	2.31	0.00	0.00	14.48	0.00	0.00	0.00	14.48	5.37	1.00	48.49	

DAYLIGHT REQUIREMENT	
Ground Floor %	90%
First Floor %	100%
Total %	190% (95%)
Total point required	4
Total point achieved	4

Sum (total floor area)/Sum(occupied area meeting daylight)

According to the daylight requirement, **At least 75% of the regularly occupied spaces** should meet the daylight factor (Source : IGBC Green homes) . **Both ground and first floor receives around 95% average** regularly occupied spaces are achieved with the desired levels and so they are awarded with full points.

WATER CONSERVATION

ENERGY EFFICIENT PLUMBING FIXTURE

S.no	Fixture type	Duration(Minutes)	Daily use per FTE	No . Of Occupants	Baseline		Proposed case	
					Flow rate	Total daily Water	Flow rate	Total daily Water
1	Water closets (High flush)	1	1	20	6	120	4	80
2	Water closets (Low flush)	1	4	20	3	240	2	160
3	Faucets-	0.25	8	20	8	320	6	240
4	Health faucets LPM	0.25	1	20	8	40	4	20
6	Kitchen sink	0.25	6	20	8	240	4	120
7	Shower head LPM	8	1	20	10	1600	6	960
				Baseline consumption		2560	Proposed Consumption	1580
				Percentage savings				38.28%

According to the water conservation credit in IGBC green homes, the water efficient plumbing fixtures are mandatory criteria and it has to be incorporated and **38.28% of water consumption** is observed after **changing the flow rate of the fixtures**.

RAIN WATER HARVESTING

RAIN FALL RUN-OFF CALCULATION

YEAR	JAN		FEB		MAR		APR		MAY		JUN		JUL		AUG		SEPT		OCT		NOV		DEC	
	R/F	%DEP	R/F	%DEP	R/F	%DEP	R/F	%DEP	R/F	%DEP	R/F	%DEP	R/F	%DEP	R/F	%DEP	R/F	%DEP	R/F	%DEP	R/F	%DEP	R/F	%DEP
2016	1.0	-77	0.0	-100	1.2	-86	0.0	-100	118.7	154	312.4	158	112.9	-48	174.4	-10	201.2	19	76.0	-54	8.8	-87	10.3	-15
2017	0.0	-100	0.0	-100	8.4	-3	0.4	-97	25.1	-46	176.6	46	217.6	0	210.4	8	101.4	-40	111.2	-32	15.6	-76	1.0	-91
2018	0.0	-100	0.3	-96	4.5	-48	3.6	-78	37.5	-20	156.0	29	210.1	-3	321.6	66	57.1	-66	30.7	-81	28.2	-57	101.4	738
2019	18.2	226	5.9	-33	14.5	6	16.7	2	15.2	-71	60.8	-47	218.7	10	192.0	-1	265.4	51	182.8	17	5.1	-93	1.8	-89
2020	10.6	89	21.8	148	8.9	-35	31.3	91	3.8	-93	126.7	10	302.4	52	186.8	-3	231.2	32	293.5	88	142.5	100	0.6	-96

Source : IMD (Indian meteorological department)

CALCULATION EXPLANATION

Year	Peak Month Rainfall	Peak Rainfall (mm)
2016	June	312
2017	July	218
2018	August	322
2019	September	265
2020	July	302
Total		1419
Average /75 days		19

- The peak month rainfall in mm is tabulated for 5 years and the total peak rainfall is 1419mm is divided by 75 days (15 days of rainfall each year).
- After calculating the total net impervious area by multiplying the area with the run-off coefficient, According to the mandatory criteria saving 25% of average peak rainfall $19/1000 * 25 = 0.005$ and so on for 50% and 75%.

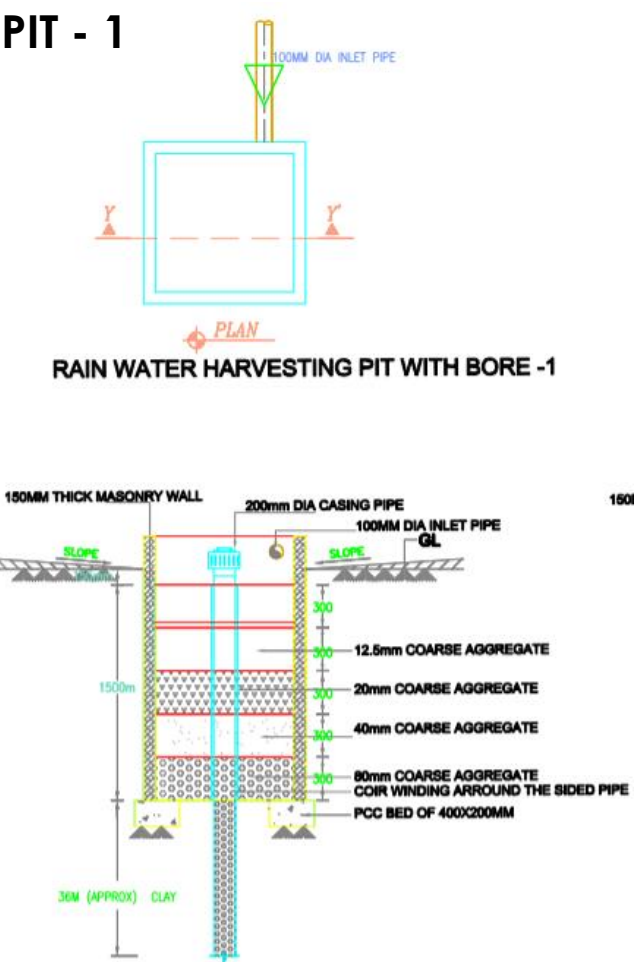
RUN-OFF CALCULATION				
S.No.	Zone	Area (sq.m.)	Run-off Coefficient	Impervious Area (sq. m.)
1	Cemented Roof	784.80	0.95	745.6
2	Vegetation	875.27	0.20	175.1
3	Hardscape (Pathways/Driveways)	346.20	0.95	328.9
Net Impervious Area				1249.5
Rainfall Intensity (m/day) considering 25% (Mandatory) of average peak rainfall				0.005
Rainfall Intensity (m/day) considering 50% of average peak rainfall (2 point)				0.009
Rainfall Intensity (m/day) considering 75% of average peak rainfall (4 point)				0.014
Total Run-off Volume (Cu.m.) for 25% average peak rain fall				5.91
Total Run-off Volume (Cu.m.) for 50% average peak rain fall				11.82
Total Run-off Volume (Cu.m.) for 75% average peak rain fall				17.74

- To find the total run off volume in Cu.m for 25% of the average peak rainfall, $0.005 * 1249.5 = 5.91$ Cu.m

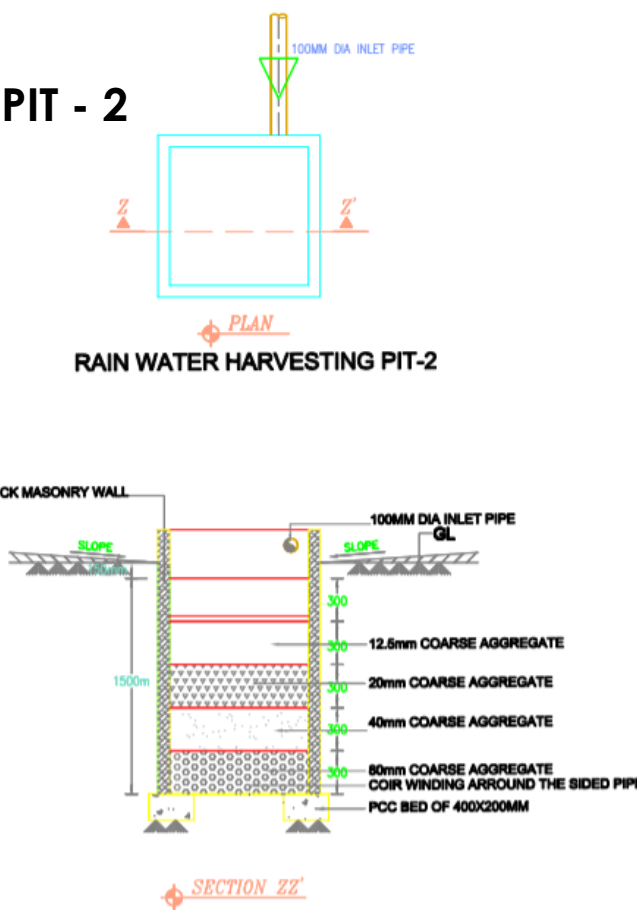
(Approximately 6 Cu.m) and for 50% and 75% it is 12 and 18 Cu.m respectively.

By providing 18 Cu.m capacity the project will be awarded with 4 points.

PIT - 1



PIT - 2



STORAGE SECTION				
Length	1.28	Total Rain water Harvesting Pits	1	
Width	1.28			
Area	1.64	Capacity of 1(one) Harvesting Pit	0.49	cum/day
Depth	0.30	Total capacity of Harvesting Pits	0.49	cum/day
GRAVEL SECTION				
Length	1.28	Total Rain water Harvesting Well	1	
Width	1.28			
Area	1.64	Capacity of 1(one) Harvesting Well	1.97	cum/day
Depth	1.20	Total capacity of Harvesting Well	1.97	cum/day
RING WELLS				
Ring Well No's	1	Soil percolation rate	10	Liters/Sq.m/hr.
Ring Well Size (Dia or Length)	0.2			
		Capacity of each ring well	5.43	cum/day or KLD
Depth	36.0	(2 x Pi x radius x height x percolation rate x 24 hrs.)		
Total Rain-Water Percolation per day			5.43	cum/day or KLD
Total Volume of Rain Water Harvested per day (in cum)			7.89	cum/day or KLD

STORAGE SECTION				
Length	1.28	Total Rain water Harvesting Pits	1	
Width	1.28			
Area	1.64	Capacity of 1(one) Harvesting Pit	0.49	cum/day
Depth	0.30	Total capacity of Harvesting Pits	0.49	cum/day
GRAVEL SECTION				
Length	1.28	Total Rain water Harvesting Well	1	
Width	1.28			
Area	1.64	Capacity of 1(one) Harvesting Well	1.97	cum/day
Depth	1.20	Total capacity of Harvesting Well	1.97	cum/day
Total Volume of Rain Water Harvested per day (in cum)			2.46	cum/day or KLD

The total volume of the rain water harvested per day with both the percolation pits are **10.35 Cu.m / day**. As per the requirement, if it is 12 Cu.m / day (2 points) and 18 Cu.m / day (4 points) so, it has to be increased a bit to make it achievable.

ENERGY EFFICIENCY

Time Period	Occupancy Schedule		Elevator Schedule	External Lighting Schedule	Basement Lighting	Basement Ventilation	HVAC Schedule	
	Weekends	Weekdays					Common Area (Gym, club house, community Hall)	Dwelling Units (Bedrooms)
00:00-01:00	1.00	1.00	0.01	0.80	0.5	0.00	0.00	1.00
01:00-02:00	1.00	1.00	0.01	0.80	0.5	0.00	0.00	1.00
02:00-03:00	1.00	1.00	0.01	0.80	0.5	0.00	0.00	1.00
03:00-04:00	1.00	1.00	0.01	0.80	0.5	0.00	0.00	1.00
04:00-05:00	1.00	1.00	0.01	0.80	0.5	0.00	0.00	1.00
05:00-06:00	1.00	1.00	0.25	0.80	0.5	0.00	1.00	1.00
06:00-07:00	1.00	1.00	0.25	0.00	0.5	0.00	1.00	0.01
07:00-08:00	1.00	1.00	0.5	0.00	0.5	0.00	1.00	0.01
08:00-09:00	1.00	0.5	0.9	0.00	0.8	1.00	1.00	0.01
09:00-10:00	1.00	0.5	0.9	0.00	0.8	1.00	1.00	0.01
10:00-11:00	1.00	0.5	0.25	0.00	0.8	0.2	0.2	0.01
11:00-12:00	1.00	0.5	0.25	0.00	0.8	0.2	0.2	0.01
12:00-13:00	1.00	0.5	0.25	0.00	0.8	0.2	0.2	0.01
13:00-14:00	1.00	0.5	0.25	0.00	0.8	0.2	0.2	0.01
14:00-15:00	1.00	0.5	0.25	0.00	0.8	0.2	0.2	0.5
15:00-16:00	1.00	0.5	0.25	0.00	0.8	0.2	0.2	0.5
16:00-17:00	1.00	0.5	0.50	0.00	0.8	0.2	0.2	0.5
17:00-18:00	1.00	0.5	0.90	0.00	1.00	0.2	1.00	0.01
18:00-19:00	1.00	1.00	0.90	0.80	1.00	1.00	1.00	0.01
19:00-20:00	1.00	1.00	0.90	0.80	1.00	1.00	1.00	0.01
20:00-21:00	1.00	1.00	0.90	0.80	1.00	1.00	1.00	0.01
21:00-22:00	1.00	1.00	0.25	0.80	1.00	0.2	0.00	1.00
22:00-23:00	1.00	1.00	0.25	0.80	1.00	0.2	0.00	1.00
23:00-24:00	1.00	1.00	0.01	0.80	0.5	0.00	0.00	1.00

Source : ECBC, Occupancy schedule for residence.

Occupancy schedule is calculated for the residence for recording the operational hours in the energy calculation.

External lighting and other uncounted lighting are considered

SOLAR PANEL CALCULATION

Fixtures	Watts	Nos	Total watts	Operation hours	Total energy consumption
Wall light	4	10	40	9.6	140.16
Ceiling light	16	316	5056	4	5905.408
Lamp	40	24	960	8	2803.2
Foot light	5	16	80	9.6	280.32
Ceiling fan	54	30	1620	12	4966.92
Exhaust fan	150	24	3600	1	1051.2
Air Conditioner	1200	16	19200	10.64	24514.56
Tv	60	17	1020	8	2978.4
Water heater	2000	9	18000	2.5	5400
Oven	2000	2	4000	1	1460
Microwave oven	900	3	2700	2	1971
Mixer	500	2	1000	0.2	73
Refridgerator	350	3	1050	24	5518.8
Total annual energy consumption					57062.968
5% miscellaneous consumption					2853.1484
Total annual energy consumption					59916.1164

Area	% used in an hour	Hours	% x Hours
Elevator schedule	0.01	6	0.06
	0.25	10	2.5
	0.5	2	1
	0.9	6	5.4
Total hours		24	8.96
External lighting schedule	0	12	0
	0.8	12	9.6
Total hours		24	9.6
Basement lighting	0.5	9	4.5
	0.8	9	7.2
	1	6	6
Total hours		24	17.7
Basement ventilation	0	9	0
	0.2	10	2
	1	5	5
Total hours		24	7
HVAC - Common areas	0	8	0
	0.2	7	1.4
	1	9	9
Total hours		24	10.4
HVAC - DW (Bedrooms)	0.01	12	0.12
	0.5	3	1.5
	1	9	9
Total hours		24	10.62

Percentage of On-site Renewable Energy Generated to the Total Annual Energy Consumption of the Building	Energy Consumption (Kwh)	Annual Energy Produced by 1Kw Solar Panel per Year (KWH)	Solar requirement (KW)	Approx. Investment in RS (Considering Rs.50,000 /KW)	Approx. Space Requirement in Sq.Ft (Considering Space Requirement 100 Sq.ft/KW)
5% (2 point)	2996	1460	2	₹ 1,02,596	205
10% (4 point)	5992		4	₹ 2,05,192	410
15% (6 point)	8987		6	₹ 3,07,788	616

4 kw is produced per day so, for a year, 4 * 365 days = 1460 Kwh is produced.

- Initially, by calculating the occupancy hours for each spaces, the operational hours are recorded in the energy calculation.
- Total annual energy consumption is 59916.1 Kwh and 5% of conserving them is around 2996 Kwh (59916.1164 * 0.05). The same is followed for 10% and 15%.
- So, the pv requirement for 5%, 10% & 15% is 2, 4 and 6Kw respectively. The cost of 1Kw is 50,000 and further more the area required are also mentioned.

Preliminary documentation (IGBC) to observe the points.

CREDIT	CURRENT STATUS
SITE SELECTION AND PLANNING – possible points 20	
Local building regulation	Approvals to be obtained from the local Government
Soil Erosion Control	Topsoil to be stockpiled & other erosion prevention measures to be adopted shall be shared by consultant team.
Basic house-hold Amenities	The project Site is in a developed area hence it close to many amenities.
Natural Topography or Vegetation	Site area – 2006 Sqm Landscape area – 800 Sqm Percentage of natural topography or vegetation – 40%
Heat Island Reduction, Roof	Exposed roof area 785 Sq.m to be coated with high SRI paint/Tile of SRI value- 78 or Roof Garden can be proposed.
Design for Differently Abled	Already adopted in the design.
Basic Facilities for Construction Workforce	Shall be incorporated
WATER CONSERVATION –possible points 23 points	
Rainwater Harvesting, Roof & Non-roof	Already achieved
Water efficient plumbing fixtures	Consultant team will assist the project team in selection of water efficient plumbing fixtures.
Landscape design	Shall be Implemented . Turf to be minimized. Landscape area to be planted with drought tolerant/native & fruit bearing species
Management of Irrigation Systems	irrigation layout required from the project team.
Rainwater harvesting roof and non-roof	Total run-off volume (Cu.m) for 50% average peak rainfall – 12 Cu.m (2 Points) 75% average peak rainfall – 18 Cu.m (4 Points). Current status – 10.35 Cu.m can be pushed for 2 points
Water Efficient Plumbing Fixtures	Consultant team will assist the project team in selection of water efficient plumbing fixtures. 38% from baseline saving is achieved.
ENERGY EFFICIENCY – possible points 20 points	
CFC Free Equipments	CFC free equipment's to be selected for Air conditioning systems under developer scope
Enhanced Energy Performance	Possible to implement as per project standards
On-site Renewable Energy	Analysis underway.
Solar Water heating System	To be achieved, Total water required – 400L 25% of (400L) = 100 L per day (1 Point) 50% of (400L) = 200 L per day (2 Points) 75% of (400L) = 300 L per day (3 Points) 95% of (400L) = 380 L per day (4 Points) Approx. Investment 15000rs for 100 Liters

**20L x 20 people =
400L (Total water
required)**

CREDIT	CURRENT STATUS	
ENERGY EFFICIENCY		
Energy efficiency in common area equipment	Possible to implement as per project standards	
BUILDING MATERIAL AND RESOURCES – possible points 18 points		
Segregation of Household Waste, Post-occupancy	Separate bins for Dry and Wet waste can be provided	
Organic Waste Management, Post-occupancy	For 50% Treated Organic Waste - 2.5 Kg For 95% Treated Organic Waste - 5Kg Approx. Investment for 5kg Eco bin – 2500rs	Waste generated = 5kg
Handling of Waste Materials, During Construction	Master material sheet to be filled with a tentative list of materials and vendors	
Reuse of salvaged materials	Difficult to achieve.	
Material with recycled content	Master material sheet to be filled with a tentative list of materials and vendors	
Local Materials	Master material sheet to be filled with a tentative list of materials and vendors	
Rapidly renewable building material & certified wood	Confirmation required on FSC wood procurement.	
INDOOR ENVIRONMENTAL QUALITY – possible points 14 points		
Tobacco Smoke Control	No smoking policy should be implemented	
Minimum daylight	Achieved in all the spaces.	
Fresh Air Ventilation	Already achieved in design.	
Enhanced daylight	Total percentage of regularly occupied area meeting daylight factor – 95%	
Enhanced fresh air ventilation	Achieved in all the required spaces.	
Exhaust systems	Already achieved in design.	
Low Voc Materials	Can be implemented	
Building flush-out	Already achieved.	
Cross Ventilation	Overall area – 566 Sqm ; Total area achieved with cross ventilation – 362 Sqm. 64% cross ventilation achieved. The Project is eligible for 2 Points	

CREDITS	POINTS AVAILABLE	POINTS AS PER CURRENT STAND	POINTS REQUIRED CLARITY/DETAILED ASSESSMENT	POINTS NOT ATTEMPTED
SITE SELECTION & PLANNING	9	9	0	0
Water Conservation	11	8	3	0
ENERGY EFFICIENCY	22	7	15	0
BUILDING MATERIAL & RESOURCES	13	5	6	2
Indoor Environmental Quality	15	13	0	2
Innovation & Design Process	5	4	1	0
TOTAL	75	46	25	4

Total credit points current status : **46 (Silver rating)**

Points required to achieve Gold : +6

Points required to achieve Platinum : +14

Target rating : Platinum

Rating	Points	
	Individual Residential Unit	Multi-dwelling Residential Units
Certified	38 – 44	50 – 59
Silver	45 – 51	60 – 69
Gold	52 – 59	70 – 79
Platinum	60 - 75	80 – 100

Fee structure

	Registration Fee (Rs.)	Certification Fee (Rs.)	Remarks
300 sq.m & below	10,000	15,000	Cost of Plaque would be extra
301 sq.m to 1,500 sq.m	15,000	15,000 plus Rs. 50 per additional sq.m over & above 300 sq.m	
More than 1,500 sq.m	20,000	75,000	

OBSERVATION & LEARNING

- ✓ Calculations **corresponding to each credits** are studied and created.
- ✓ **Documentation** related to the obtained results via calculations are recorded.

Comparing the IGBC Factory & IGBC homes

CREDITS	POINTS AVAILABLE for IGBC Factory	POINTS AVAILABLE for IGBC green homes version 2
SITE SELECTION & PLANNING	16	9
Water Conservation	21	11
ENERGY EFFICIENCY	23	22
BUILDING MATERIAL & RESOURCES	16	13
Indoor Environmental Quality	19	15
Innovation & Design Process	5	5
TOTAL	100	75

- ✓ Rating designed related to their specific context
- ✓ Energy efficiency given maximum points

CREDITS of IGBC homes individual	Credits not required
SITE SELECTION & PLANNING	Heat island effect, visitor parking, electric charging & IGBC guidelines post occupancy
Water Conservation	Waste water treatment and reuse and water meter
ENERGY EFFICIENCY	Distributed power generation and energy metering
BUILDING MATERIAL & RESOURCES	-
Indoor Environmental Quality	-
Innovation & Design Process	-

PROJECT - 4

Building typology – Residential apartment

Location – Andhra Pradesh

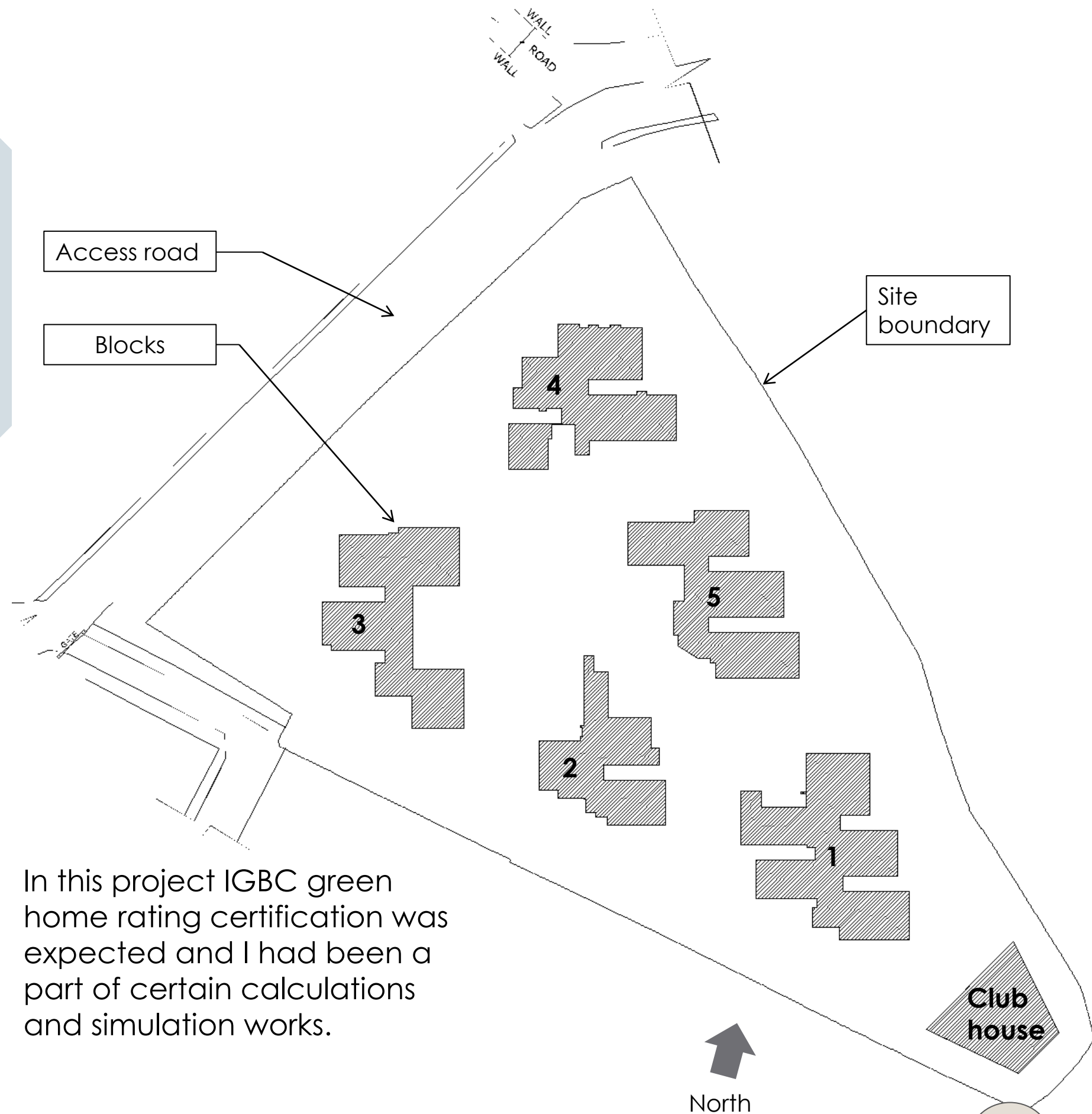
Total site area – 23079 Sqm, 5.7 Acres(Approx.)

5 blocks (Almost completed)

Type of Apartment – High rise residential

Rating followed – IGBC Green homes

Work done – Outdoor views calculation and daylight analysis in IES software.



In this project IGBC green home rating certification was expected and I had been a part of certain calculations and simulation works.

OUTDOOR VIEW CALCULATION

Regularly Occupied Spaces	Total Floor Area (Carpet) (Sq.m)	Window Opening	Direct Sight Line	Obstruction (8M)	Access either to Sky or flora and fauna	Eligible	Meet The Requirement
M.Bed	15.98	SD2	YES	NO	YES	YES	15.98
Bedroom - 1	13.03	SD2	YES	NO	YES	YES	13.03
Bedroom - 2	15.04	W2	YES	NO	YES	YES	15.04
Kitchen	10.74	KW	YES	YES	YES	YES	10.74
Living&Dining	50.35	SD2	YES	NO	YES	YES	50.35

Block – 1 Fla1 - 1

Total Regular Occupied Area	77.07
Total Area Meet the Requirement	77.07
Percentage Achieved	100%

Regularly Occupied Spaces	Total Floor Area (Carpet) (Sq.m)	Window Opening	Direct Sight Line	Obstruction (8M)	Access either to Sky or flora and fauna	Eligible	Meet The Requirement
M.Bed	13.35	W2	YES	NO	YES	YES	13.35
Bedroom 1	12.95	W2	YES	NO	YES	YES	12.95
Bedroom 2	14.00	SD2	YES	NO	YES	YES	14.00
Kitchen	9.51	KW	YES	YES	YES	YES	9.51
Living&Dining	51.43	SD1	YES	NO	YES	YES	51.43

Block – 1 Fla1 - 2

Total Regular Occupied Area	87.24
Total Area Meet the Requirement	87.24
Percentage Achieved	100%

Regularly Occupied Spaces	Total Floor Area (Carpet) (Sq.m)	Window Opening	Direct Sight Line	Obstruction (8M)	Access either to Sky or flora and fauna	Eligible	Meet The Requirement
M.Bed	21.61	W3	YES	YES	YES	YES	21.61
Bedroom - 1	14.98	W1	YES	NO	YES	YES	14.98
Bedroom - 2	16.93	W1	YES	YES	YES	YES	16.93
Kitchen	4.20	KW	YES	YES	YES	YES	4.20
Living&Dining	54.44	SD1	YES	NO	YES	YES	54.44

Block – 1 Fla1 - 3

Total Regular Occupied Area	80.25
Total Area Meet the Requirement	80.25
Percentage Achieved	100%

Regularly Occupied Spaces	Total Floor Area (Carpet) (Sq.m)	Window Opening	Direct Sight Line	Obstruction (8M)	Access either to Sky or flora and fauna	Eligible	Meet The Requirement
M.Bed	17.56	W1	YES	YES	YES	YES	17.56
Bedroom - 1	16.17	W1	YES	YES	YES	YES	16.17
Bedroom - 2	14.49	SD1	YES	YES	YES	YES	14.49
Kitchen	9.97	KW	YES	YES	YES	YES	9.97
Living&Dining	44.83	SD1	YES	YES	NO	NO	44.83

Block – 1 Fla1 - 4

Total Regular Occupied Area	72.36
Total Area Meet the Requirement	72.36
Percentage Achieved	100%

Regularly Occupied Spaces	Total Floor Area (Carpet) (Sq.m)	Window Opening	Direct Sight Line	Obstruction (8M)	Access either to Sky or flora and fauna	Eligible	Meet The Requirement
M.Bed	19.25	W1	YES	NO	YES	YES	19.25
Bedroom - 1	18.82	W1	YES	YES	YES	YES	18.82
Bedroom - 2	16.86	SD1	YES	NO	YES	YES	16.86
Kitchen	11.23	KW	YES	NO	YES	YES	11.23
Living&Dining	48.04	SD1	YES	NO	YES	YES	48.04

Block – 1 Fla1 - 5

Total Regular Occupied Area	78.52
Total Area Meet the Requirement	78.52
Percentage Achieved	100%

Similarly, the calculations was done for the other blocks as well.

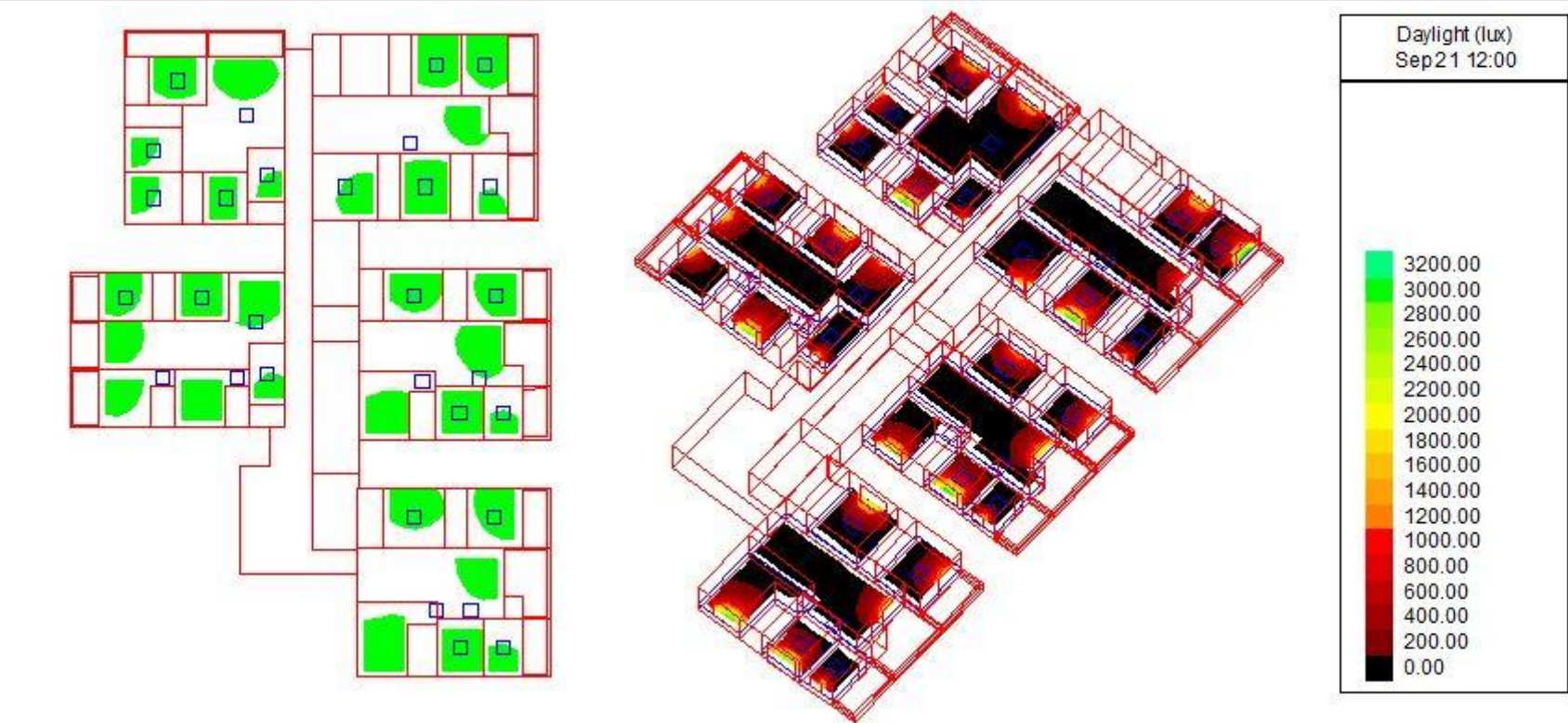
DAYLIGHT SIMULATION IN IES

Daylight simulation is done in IES software and the values achieved are analyzed and points are awarded.

Calculated:
Sky Model:
Working plane height:
Grid Size:
Illuminance Threshold (%):

12 Jan 2022 at 1:05 pm
CIE Clear Sky at 21 Sep 12:00
0.850m
1.000m
108.000

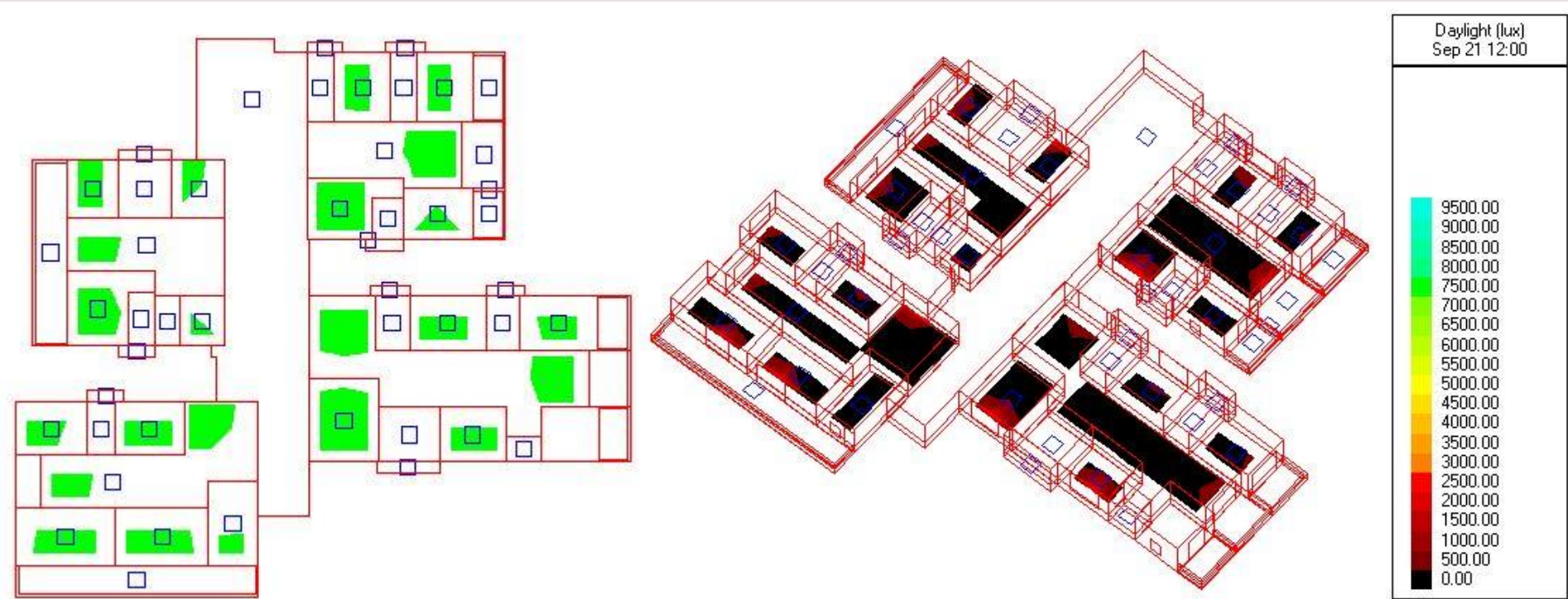
BLOCK – 1



BLOCK - 1	Daylight levels (lux)	% above threshold
Flat – 1	307.27	76.3
Flat – 2	242.25	77.3
Flat – 3	297.97	78.1
Flat – 4	361.19	80.3
Flat – 5	345.66	77.6

All flats are above 75% above threshold

BLOCK – 2



BLOCK - 2	Daylight levels (lux)	% above threshold
Flat – 1	324.60	77.5
Flat – 2	256.53	77.8
Flat – 3	334.26	79.9
Flat – 4	323.13	76.7

All flats are above 75% above threshold

DAYLIGHT SIMULATION IN IES

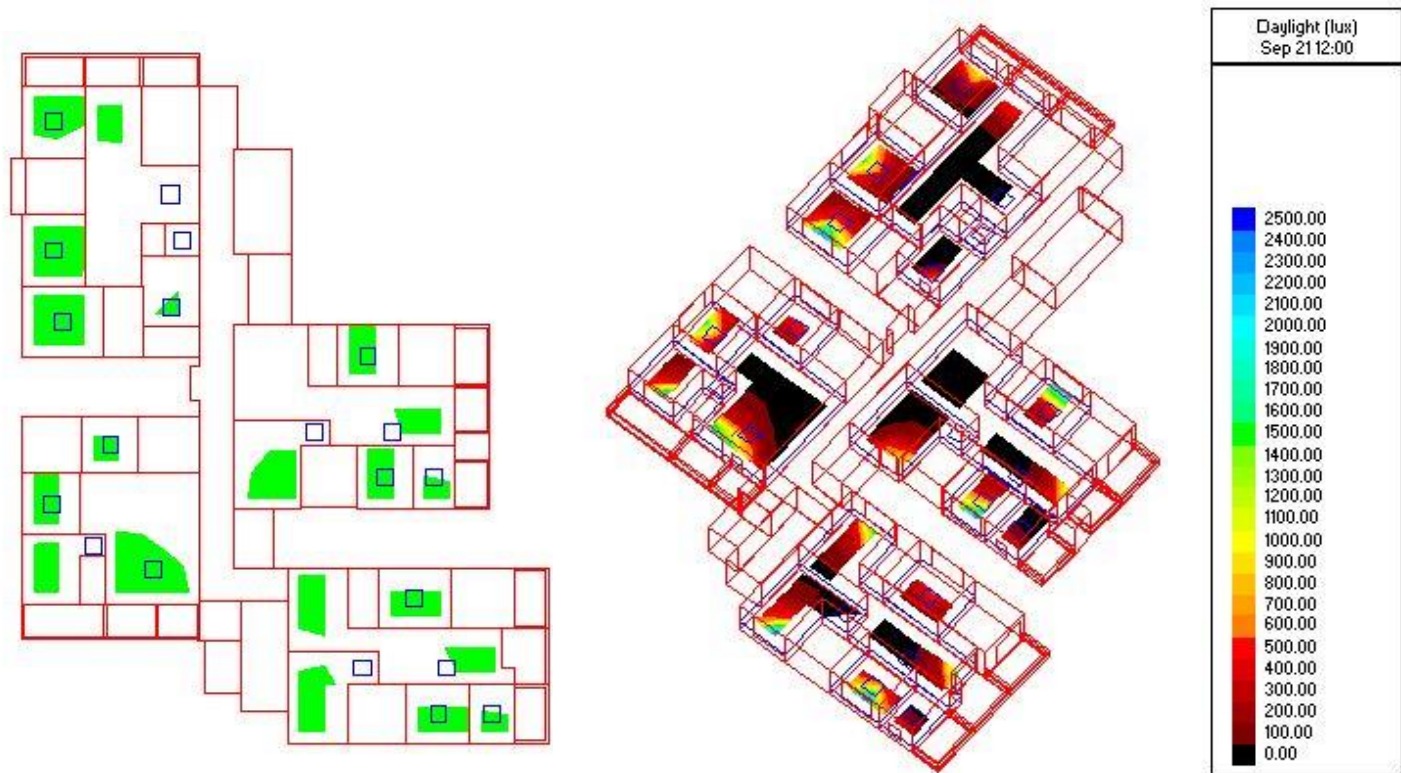
Regularly occupied spaces : Living/dinning, bedrooms, kitchen and study rooms.

Other rooms present : Multipurpose room/home theatre, toilets, servant rooms and balconies.

Calculated:
Sky Model:
Working plane height:
Grid Size:
Illuminance Threshold (%):

12 Jan 2022 at 1:05 pm
CIE Clear Sky at 21 Sep 12:00
0.850m
1.000m
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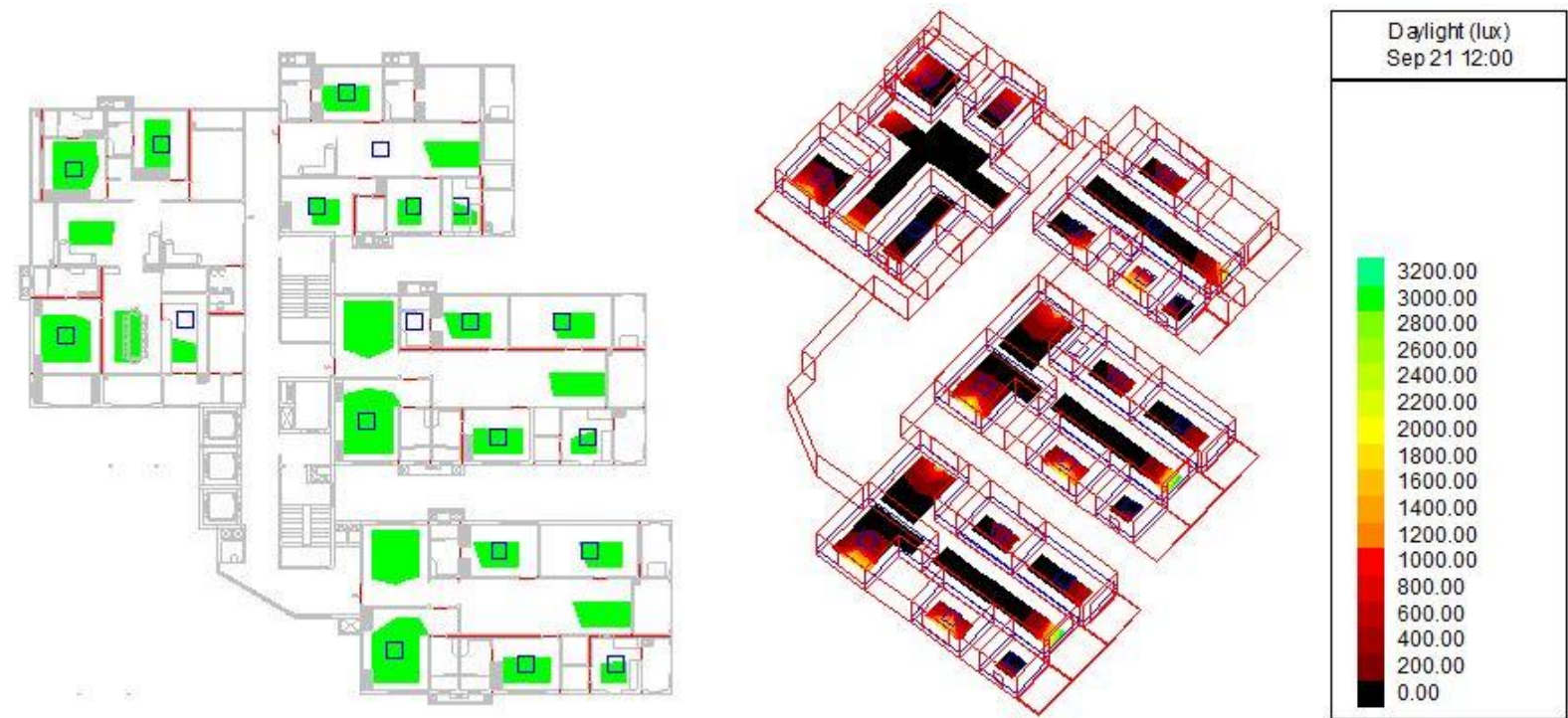
BLOCK – 3



BLOCK - 3	Daylight levels (lux)	% above threshold
Flat – 1	398.51	77.6
Flat – 2	263.72	78.2
Flat – 3	322.49	79.7
Flat – 4	385.61	79.6

All flats are above 75% above threshold

BLOCK – 4

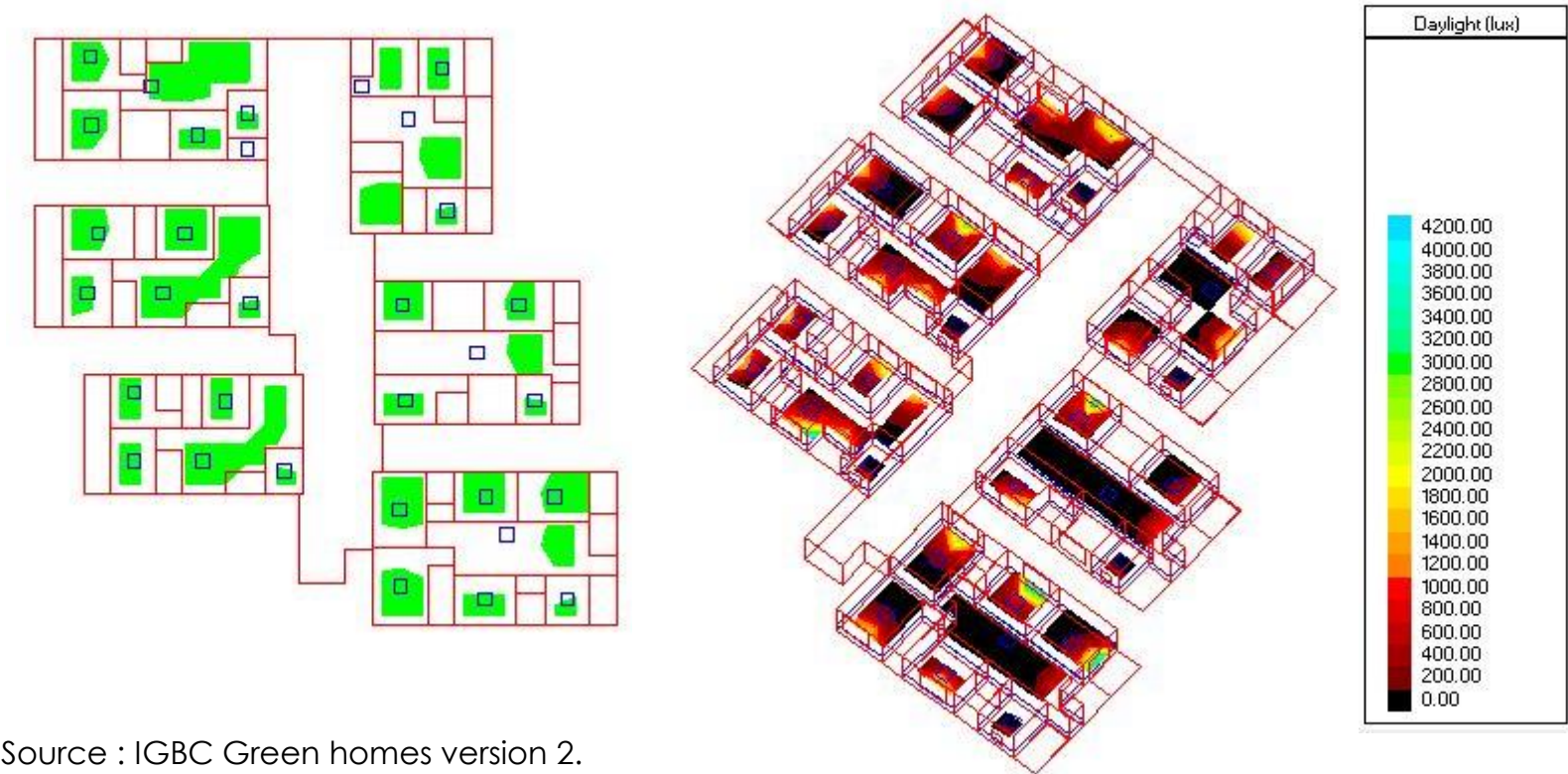


BLOCK - 4	Daylight levels (lux)	% above threshold
Flat – 1	300.50	76.8
Flat – 2	295.117	77.1
Flat – 3	429.36	76.9
Flat – 4	420.10	78.5

All flats are above 75% above threshold

DAYLIGHT SIMULATION IN IES

BLOCK – 5



Source : IGBC Green homes version 2.

BLOCK - 5	Daylight levels (lux)	% above threshold
Flat – 1	701.04	78
Flat – 2	522.63	77.1
Flat – 3	489.30	77.6
Flat – 4	412.68	77.3
Flat - 5	343.94	76.8
Flat - 6	462.45	77.2

All flats are above 75% above threshold

Option 2: Simulation Approach

For Individual Residential Unit

MINIMUM DAYLIGHT

Demonstrate through simulation that 50% of the regularly occupied spaces achieve daylight illuminance levels of a minimum of 10 footcandles (fc) (108 lux) in a clear sky condition on 21st September at 12 noon, at working plane.

Option 2: Simulation Approach

For Individual Residential Unit

ENHANCED DAYLIGHT

Demonstrate through simulation that 75% of the regularly occupied spaces achieve daylight illuminance levels of a minimum of 10 footcandles (fc) (108 lux) in a clear sky condition on 21st September at 12 noon, at working plane.

As per the IGBC green homes version 2, for minimum daylight 50% of regularly occupied space should with 108 lux level and for enhanced daylight 75% of the regularly occupied space should be with 108 lux.

All the spaces in all 5 blocks typical floor is above 75% and the points are achieved.

OBSERVATION & LEARNING

- ✓ In order to achieve the **connectivity to exterior credit**, the outdoor view calculation was done and all the blocks met the requirement.
- ✓ Understanding of IES daylight simulation.

CRITICAL OVERVIEW

- **Rating certification benefits to the client** : First major benefit is through **marketing strategy**, the clients attract many **occupants** and then they are also benefitted by the **advantages** received after obtaining the rating.
- **How do you convince the client** : Majorly, the clients and architects **usually approaches** towards the green consultant and others are **convinced by making them understand the long term savings** and other benefits they will **acquire** over a period of time by adopting **certain techniques**.
- **Approximate cost in obtaining certification** : Depending upon the **additions** which has to be done from **3 to 5%** of the project cost will increase.
- **Challenging project : Minor challenges** are faced in each project and **suitable possible alternatives** are framed for them as well.
- **Accuracy of lighting simulation** : The results obtained from any software for any simulation is the **worst case scenario**.

OVERALL LEARNING & UNDERSTANDING

OFFICE CULTURE

- Difference in work pattern from a regular architectural office.
- Steps involved in handling a project.

WORKS

- IGBC feasibility report for factory and residences and their respective calculations and
- Conceptual designing in a large scale project.

SOFTWARE

- **ECOTECH** – Modeling and day light simulation.
- **DESIGN BUILDER** – Basics
- **IES** – Modeling and daylight simulation

THANK YOU

SHIFANA FATHIMA .V

M.ARCH SA II YEAR
40890016

Sathyabama Institute of
Science and technology

